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Study Of The Energy Potential Of Solid Waste In Bauchi Town

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ABSTRACT:

The study of the energy potential of solid wastes in Bauchi Town was carried out, on the average the combination of plastics, rubber, polyethene bags constituted about 33% of the wastes, followed by textile materials, leathers, wood 26%and combination of papers, cartons 15%. The heating values or calorific value of the wastes was determined to be about 6.83 MJ/kg almost one-third of the energy content of sub-bituminous coal which is 19.4 MJ/kg was as determined using a digital calorimeter.

SIGNIFICANCE OF THE RESEARCH

The research will come up with records of wastes disposed and their energy potential that is their heating value. This will sensitize the state to adopt the waste to energy incineration system. Further, if this system is implemented together with solid waste recycling in form of compost and re-use, the principles of sustainable development would be supported.

Keywords: *Energy potential, heating value, incineration, municipal solid waste and simulation*

I. INTRODUCTION

Bauchi lies between Latitude 9.3^0 and 12.3^0 North of the Equator and Longitude 8.5^0 and 11^0 East of the Greenwich meridian. It is one of the states in the Northern part of Nigeria that span two distinctive vegetation zones, namely, the Sudan Savannah and the Sahel Savannah. The former covers the southern part of the state.Here the vegetation gets richer towards the south , especially along water sources or rivers but generally the vegetation is less uniform and grasses are shorter than what obtains further south, which is the forest zone of the middle belt.While the latter also known as the semi-desert vegetation, becomes manifest from the middle of the state as one moves one moves from the south to the Northern part of the state. The characteristics of this type of vegetation comprise of isolated strands of thorny shrubs. The state has three main geological formations-the Basement complex in the south, keri-keri in north eastern part and chad formation in the north.(Bauchi State diary 2012).

The state capital is growing fast. Bauchi a major city center with a population of about 500 000 inhabitants and passers-by, is not left behind in generating heaps of refuse, that could be collected, processed and converted to useful energy as done elsewhere. That is why this research will conduct a study on the energy potential of these wastes.

Presently, most of the municipal solid wastes generated in Nigeria are dumped or disposed along road sides, causing danger to public health and to environment. The waste management system is below acceptable standards. Researchers have been making moves to find ways of developing techniques to manage these wastes in Nigeria and elsewhere.

This research tries to introduce another source of energy generation that was hither-to neglected .Nigeria is looking for investors but has no enough energy to power machineries and processes. It is worthy of note the abundance of wastes from agricultural activities. Farm produce like cereals and legumes (sorghum, maize, millet, wheat, cowpea and groundnuts as well as fruits and vegetables (oranges, mangoes, tomatoes, onions and so on) ,they all contribute solid wastes products. Added to them is the sugarcane bagasse which researches have shown that it has a good amount of energy in form of biomass (Adio, etal 2009.

About 13.9 million residents living in 2.96 million households generates approximately 7000 t d−1 of MSW at the rate of 0.500 kg−1capita−1 d−1 in Delhi (DUEIIP 2001) In year 1998, the population of Kuala Lumpur (KL), Malaysia was about 1,446,803, which ascended up to 2,150,000 in year 2005, however, solid waste generation was 2257 t d−1 in 1998 which is estimated to reach up to 3478 t d−1 in 2005 (Sivapalan K, et al 2002).

A Study conducted at the University of Port-Harcourt revealed that, the energy content of the solid wastes was observed to be 18.43MJ/kg which is significant and hence can be used for electric energy generation at the University campus. (JOST. 2010.1(1):29-36)

In that study on the energy content of solid waste it was found that if a combustion power plant were to operate at an assumed overall efficiency of 10% only, about 585KW of electricity would be generated daily. While at 50% efficiency about 2923 KW would be generated daily. (Momoh, O.L.Y., Odonghanro, B and Diemuodeke, 2010).

Another study conducted by Edward S.R (2001) found that about 18million tones of refuse was discharged annually in the United Kingdom and refuse contained sufficient energy to supply about 5% of its energy requirement, this potential together with forecasted depletion of non-renewable fossil fuel reserves led to a serious research into the possibilities of energy recovery from solid waste in our cities.

In the study of energy conservation from municipal solid wastes in Nigeria (2011), analysis and Analysis and evaluation from the work showed that about 2.26 MW of electrical energy could be generated daily from waste per city. (NSE-Technical Transactions 2011.46 (3): 1-9) This is quite significant in the demand for alternative energy sources in Nigeria. (Ujile A.A and Lebele B.T.2011) **2.9** In the paper by Mehmet Melikoglu (2012) titled: **'**Vision 2023: Assessing the feasibility of electricity and biogas production from municipal solid waste in Turkey'. Turkey imports most of its energy. However, according to the recently avowed vision 2023 agenda the country also plans to produce 30% of its electricity demand from renewable energy sources by 2023. Meanwhile, each year around 25 million tonnes of municipal solid waste (MSW) is generated nationwide . Not only MSW pollutes the environment handling, proes sing and storage requires precious labour and capital . In that context, a synergistic solution can be created between MSW management and energy supply. In this study , economics and environmental impacts of electricity generation from MSW via (i) direct combustion and (ii) biogas harnessing in 81 cities of Turkey is analysed in detail for a period between 2012 and 2023. Firstly, it is estimated that nationwide 8500 GWh of electricity could have been generated by direct combustion of MSW in 2012. This is predicted to rise 9700 GWh in 2023 . It is calculated that 3100 million m^3 of methane would be emitted from the landfills of Turkey in 2012. If no action taken this would rise to 3600 million m^3 in 2023. Furthermore, it is estimated that by capturing 25% of this methane via landfill bioreactors 2900 GWh or 0.5% of Turkey's annual electricity demand could be supplied in 2023. Simulations also showed that by realizing apposite landfill investments by 2023 annual energy savings worth 200–900 million h could be generated from MSW. Consequently, this could lead to greenhouse gas emission savings up to 11.0 million tonnes of CO_2 per annum. (Renewable and Sustainable Energy Reviews 19 (2013) 52–63).

METHODOLOGY

The method to be employed in carrying out this research is as follows:

- Literature review made from past work.
- Data determination with the Bauchi State Environmental Protection Agency (BASEPA) and the Cosmopolitan Cleaners.
- Practical determination and evaluation of the energy potential of the solid wastes collected per unit mass using a digital calorimeter.
- Analysis and evaluation of the data.

1.1DATA PRESENTATION AND ANALYSIS

The number of trips made to the final disposal sites for the three major areas of the town on a daily basis were recorded and presented in the table below.

TABLE 1: SOLID WASTE COLLECTON IN BAUCHI

Part of the town	Number of trips/day	Mass of waste disposed/day *(Kg/day)*	Volume of the waste *(m^3/day)*
Southern area	25	32,212.50	67,50
Central area	27	34,789.50	72.90
Northern area	23	29,635.50	62.10
Total	75	96,637.50	202.50

TABLE 2: WASTES COMPOSITION FOR SOUTHERN AREA OF THE TOWN

S/N	**Waste material**	**Composition by mass (kg/day)**	**Composition by percentage (%)**
1	plastics/rubbers/polyethene bags (A)	8,697.40	27
2	Textile materials, leathers, wood (B)	7,408.88	23
3	Grasses, sugar cane bagasse, crop stalks (C)	6,764.63	21
4	Papers, cartons (D)	4,831.88	15
5	Tins, cans, glasses bottles (E)	1,610.63	5
6	Animal bones/horns and dungs (F)	966.38	3
7	Ashes/Dusts/Dirt (G)	644.25	2
8	Remaining (H)	966.38	3
	Total	**32,212.50**	100

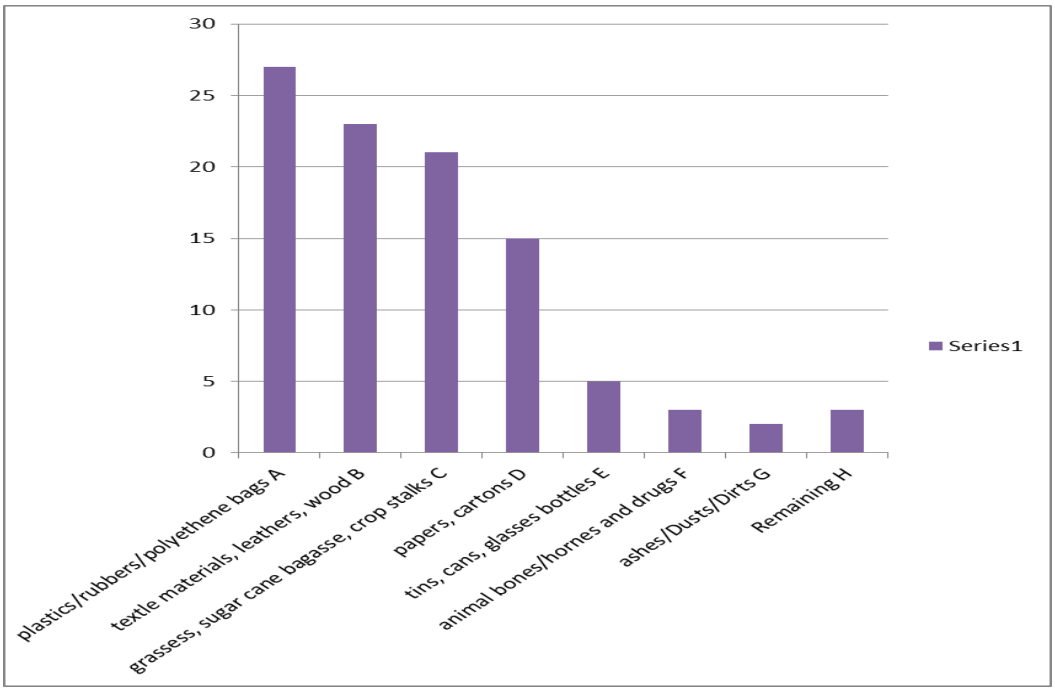

Figure 1.Waste composition for southern area

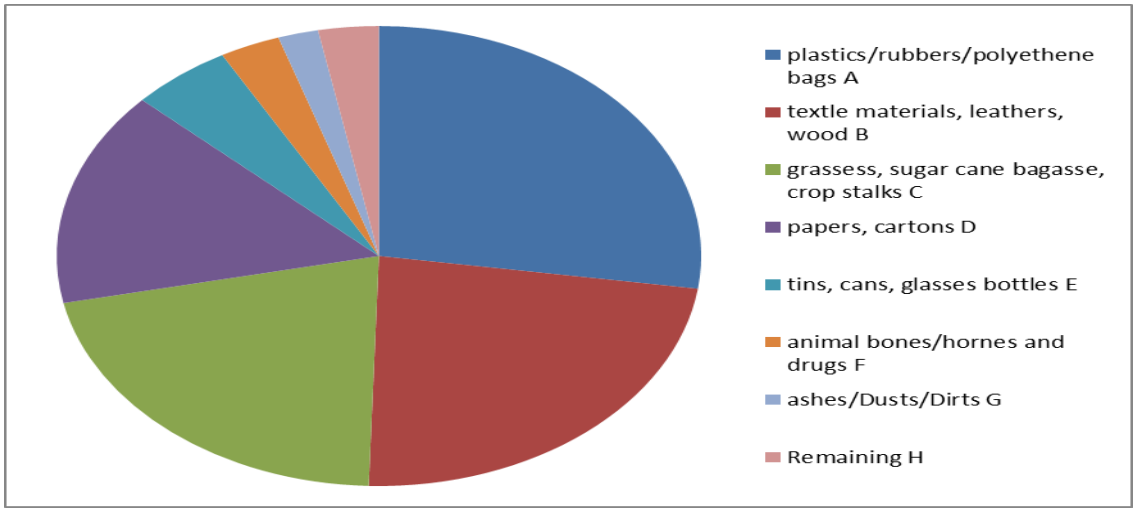

Figure 2. Waste composition for southern area

TABLE 3: WASTES COMPOSITION FOR CENTRAL AREA OF THE TOWN

S/N	Waste material	Composition by mass (kg/day)	Composition by percentage (%)
1	plastics/rubbers/polyethene bags (A)	9,741.06	28
2	Textile materials, leathers, wood (B)	8,696.38	25
3	Grasses, sugar cane bagasse, crop stalks (C)	6,610.00	19
4	Papers, cartons (D)	5,914.22	17
5	Tins, cans, glasses bottles (E)	2,087.37	6
6	Animal bones/horns and dungs (F)	347.90	1
7	Ashes/Dusts/Dirt (G)	1,043.69	3
8	Remaining (H)	347.90	1
	Total	**34,789.50**	100

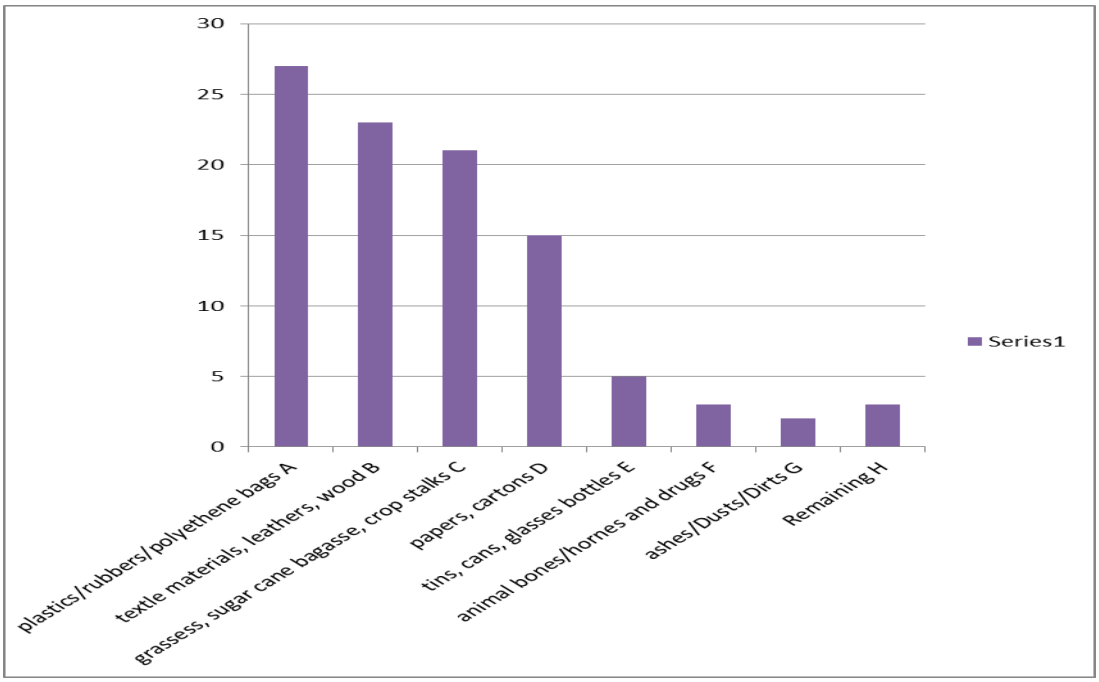

Figure3.Waste composition for central area

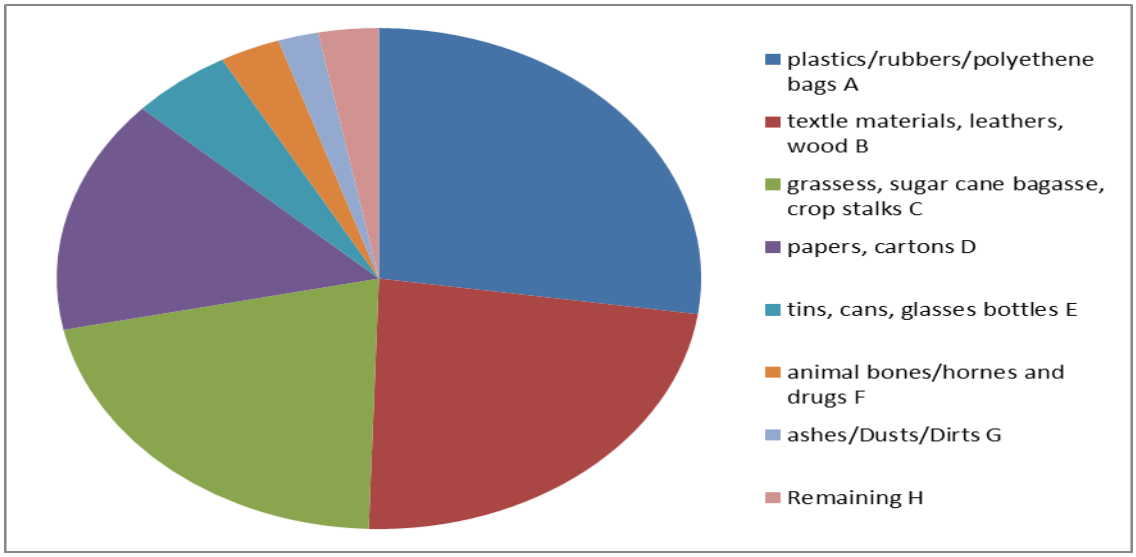

Figure 4. Waste composition for central area

TABLE 4: WASTES COMPOSITION FOR NORTHERN AREA OF THE TOWN

S/N	Waste material	Composition by mass (kg/day)	Composition by percentage (%)
1	plastics/rubbers/polyethene bags (A)	7,705.232	26
2	Textile materials, leathers, wood (B)	6,519.81	22
3	Grasses, sugar cane bagasse, crop stalks (C)	8,001.59	27
4	Papers, cartons (D)	4,741.68	16
5	Tins, cans, glasses bottles (E)	1,481.78	5
6	Animal bones/horns and dungs (F)	592.71	2
7	Ashes/Dusts/Dirt (G)	296.36	1
8	Remaining (H)	296.36	1
	Total	**29,635.50**	100

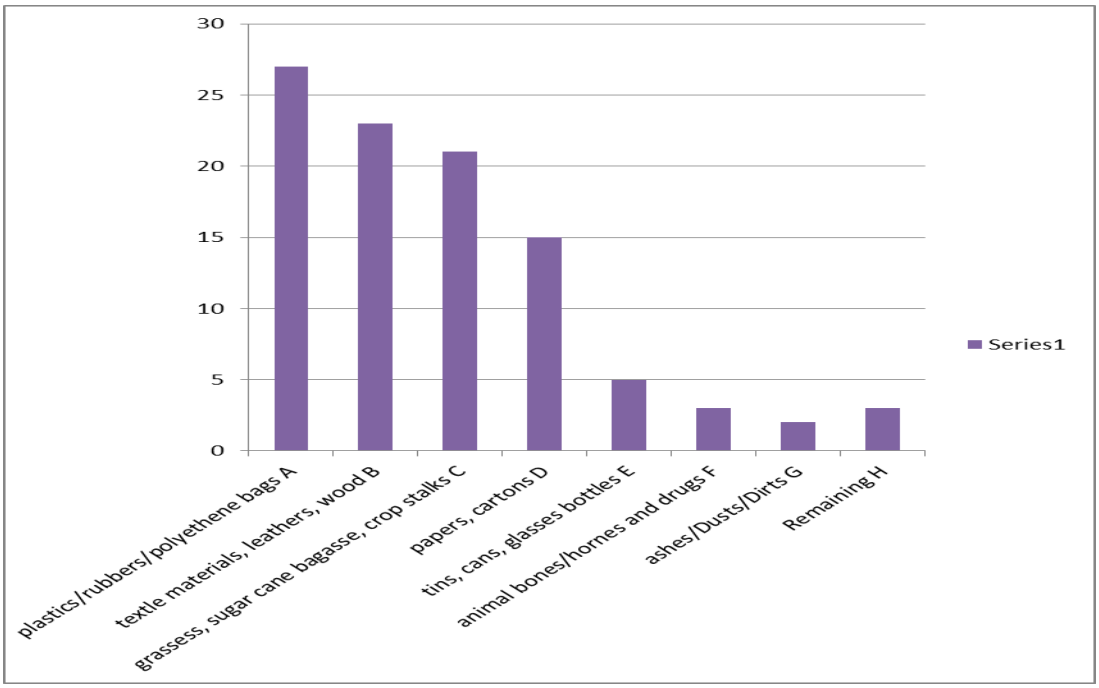

Figure 6. Waste composition for Northern area

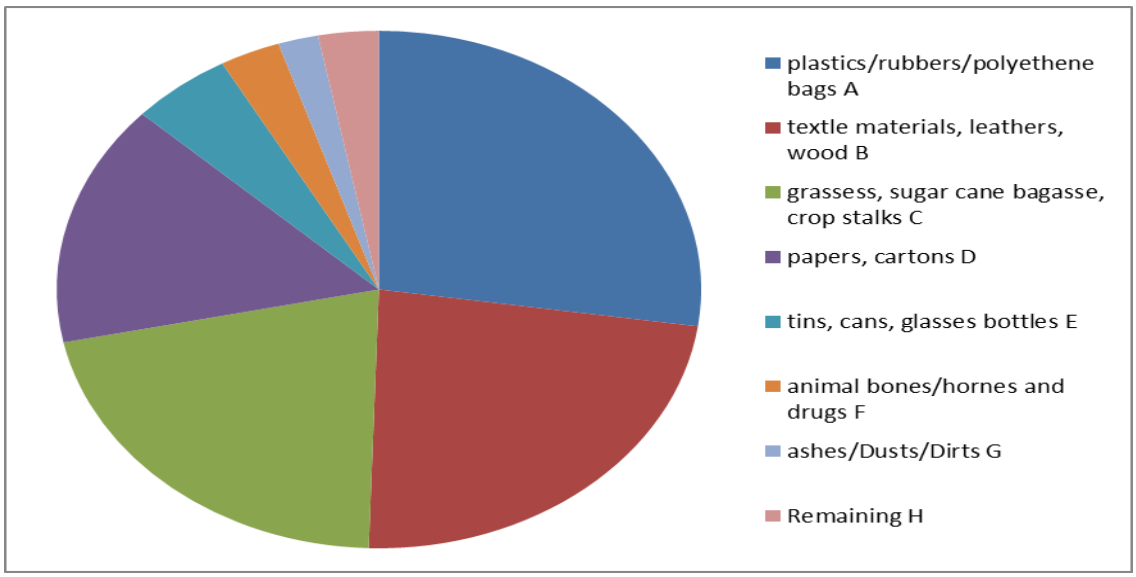

Figure 5 Waste composition for northern area

1.2 ENERGY POTENTIAL OF SOLID WASTE IN BAUCHI

The energy potential of solid waste disposed in Bauchi was determined practically and therefore can be ascertained whether it could be harnessed as a source of energy especially for electricity generation when burnt in a controlled incinerators whereby, the heat produce and from the combination of these wastes is utilizes in boilers that convert water to high pressure steam which in turn can drives turbine that convert mechanical energy to electrical power

1.3 SAMPLE DETERMINATION OF ENERGY POTENTIAL OF SOLID WASTES COLLECTED

Plastic, rubbers, polyether bags for the three areas were 8,67.40, 9,741.06 and 7,7,05.23kg/day respectively. Average would give 8,714.56 kg/day referring to table 4 for, moisture of plastics of about 2%, then the components would give = 8714.56 x (100-2)% =8714.56 x 0.98=8,540kg/day dry solid waste. Same procedure was followed to come up with the average dry solid component of solid waste collected.

TABLE 5: DRY COMPONENT OF THE SOLID WASTE COLLECTED.

S/N	Waste material	average of the material (kg/day)	Average percentage (%)
1	plastics/rubbers/polyethene bags (A)	8,540	33
2	Textile materials, leathers, wood (B)	6,788	26
3	Grasses, sugar cane bagasse, crop stalks (C)	2,850	11
4	Papers, cartons (D)	4,853	19
5	Tins, cans, glasses bottles (E)	1,554	6
6	Animal bones/horns and dungs (F)	190	0.7
7	Ashes/Dusts/Dirt (G)	609	2
8	Remaining (H)	494	1.9
	Total	**25,878**	**100**

1.4 ANALYSIS OF THE RESULT

The value obtained is an approximation because there are variations in the nature and content of the wastes collected and that the mean of the waste is used. Never-the-less, a sufficiently high value is realized w/hen compared with the calorific value of sub-bituminous coal which is 19.4 MJ/kg (EPRT,1997) and (USDOE,1997), therefore with an average value of 6.43 MJ/kg and a total solid waste collection rate of about 96 tones per/day from the city of Bauchi as determined, if simulation of electrical output is carried out by assuming different operating overall efficiencies for the mass fired incinerator power plant. The overall efficiency of a mass-fired incinerator is given by equation (8)

$$Efficiency\ \eta = \frac{Electrical\ energy\ output}{Energy\ input} \quad \text{.....(8)}$$

For the purpose of this study the energy input is the product of solid waste which is the fuel (about 96,637kg/day) and the calorific value of the waste in MJ/kg (Edward S.R2001).

That is energy input = mass flow rate of fuel x calorific value of fuel

Therefore, electrical output =efficiency x mass flow rate fuel x calorific value of solid waste.

Thus the potential for electrical energy generation for a fuel feed rate of 96,637kg/day, calorific value of 6.43MJ/kg and assumed overall efficiency values ranging between 0.1 and 1.0 can be projected as shown in figure (5) but 1MJ/s=1MWof electricity energy. For instance if the incinerator power plant were to operate as an assumed overall efficiency of 0.1 (10%), then the energy output would be as follows.

$$E = 96637\ kg/day\ x 6.43\ MJ/kg\ x\ 0.1$$

$$E = 62{,}138 \text{MJ/day} = 0.72\ \text{MJ/s}$$

It can be seen that if the plant was to operate at 10% efficiency, as much as 0.72 MW of electricity can be generated daily in Bauchi while as much as 3.6 MW of electricity can be generated daily at 50% efficiency

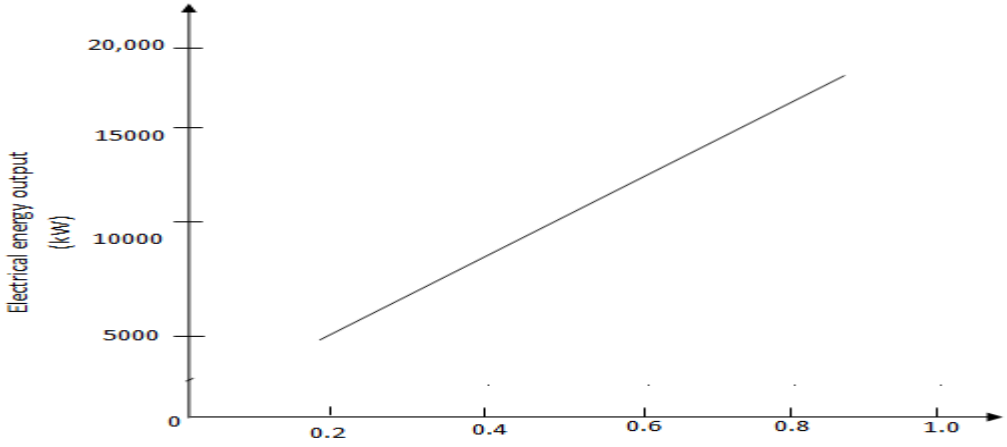

Figure 6:. Relationship between simulated electrical energy output and power plant assumed efficiencies.

1.5 CONCLUSION

The solid waste generated in Bauchi was observed to be comprised largely of combustible materials, like plastics, polyethene, food waste and yard waste and so on. The average calorific value of the wastes was observed to be about one-third of sub-bituminous coal. The suitability of the solid waste generated in Bauchi as a source of energy in mass-fired incinerator was assessed to be a feasible source of electrical energy even if the mass-fired incinerator operated at an efficiency of 40%.

REFERENCES

[1.] Abu-Qudais M, Abu-Qdais H.A. (2000). Energy content of municipal solid waste in Jordan and its potential utilization. Energy Conversion & Management; 41:983–91.

[2.] .ASTM, 1987. "Standard Test Method for Gross Calorific Value of Refuse Derived Fuel by the Bomb Calorimeter", E 71 1, p. 301.

[3.] BASEPA Blue Print (2004).

[4.] Bauchi State Diary (2012)

[5.] Bridgwater, A.V. and C.J. Mumfold (1979), Waste Recycling and Pollution Contol Handbook. The Pitman Press, Bath, Great Britain.

[6.] Bridgwater, A.W., 1980. "Packaging Materials, Industrial Possibilities for Resource Recovery", Resource Recovery and Conservation, Vol. 5, p. 5 1

[7.] Bhinde A.D. (1999) Strategies for improvement of urban solid waste management in India. New Delhi: Touchstone Publishers and Printers.

[8.] Beede D.N, Bloom D.E. (1995) The economics of MSW. The World Research Observer;10(2):113–50.

[9.] CPCB, (2002). Central Pollution Control Board. Management of Municipal Solid Wastes, New Delhi, India.

[10.] CEBAS, (2009). Campus Environmental Beautification and Sanitation, University of Port-Harcourt, Rivers State, Nigeria, Data Log.

[11.] CPHEEO, (2000). Manual on municipal solid waste management. New Delhi: Central Public Health and Environmental Engineering Organisation, Ministry of Urban Development.

[12.] Diaz , L. F., Savage G. M., Golueke, C. G., (1982). Resource Recovery from Municipal Solid Wastes, Vol. 2, Final Processing, CRC Press, Florida, p. 1.

[13.] DUEIIP (2001), Delhi urban environment and infrastructure improvement project. Government of National Capital Territory of Delhi and Government of India Ministry of Environment and Forests (MoEF), India;.

[14.] Eastop T.D. and McConkey A. (2002), Applied Thermodynamics for Engineers and Technologists. 5th edition. Longman Group U.K. Ltd.

[15.] Edward, S.R. (2001). Introduction to Engineering and the Environment, McGraw Hill Water Resources and Environmental Engineering series, 1st edition. U.S, Pp. 163 – 178.

[16.] EPRI (1997). Power Plant Chemical Assessment Model Version 2.0 CM-107036 VI, Electric Power Research Institute, Palo Alto Capp. 367-379.

[17.] Union Health Ministry Report, 2004. <http://www.agapeindia.com/india population.htm>.

[18.] Hoornweg D, Laura T. (1999). What a waste: solid waste management in Asia. Working Paper Series No. 1.Washington, DC: Urban Development Sector Unit, East Asia and Pacific Region, The World Bank;.

[19.] Hasselriis, F. (1984). Refuse Derived Fuel, An Ann Arbor Science Book Butterworth Publisher Boston, Pp. 67. Bridgwater A.V. and Mumfold C.J (1979). Waste Recycling and Pollution Control Handbook, Great Britain the Pitman Press, Bath.

[20.] Khan, Z.A and ABU-GHARAH, Z.H. (1991). New Approaches for Estimating Energy Content in MSW. ASCE Journal of Environmental Engineering 117 (3): 376 – 380.

[21.] Klee A.J. and Carruth, D. (1970). Sample Weights in Solid Waste Composition Studies, ASCE Journal of the Sanitary Engineering Division. 96, 5A, 345 – 354.

[22.] Law 3851/2010 Accelerating the development of renewable energy sources to deal with climate change and other regulations addressing issues under the authority of the Ministry of Environment, Energy and Climate Change, available online: http://www.ypeka.gr/Default.aspx?tabid=285.

[23.] Lohani, B.N. (1984). Recycling Potential of solid waste in Asia Through Organized Scavenging. *Conservation and Recycling*. 7 (2-4), 181-190.

[24.] Sharholy M, Ahmad K, Vaishya R, Gupta R. (2007). Municipal solid waste characteristics and management in Allahabad, India. Waste Management; 27(4): 490–6.

[25.] Sivapalan K, Muhd Noor M.Y, Abd Halim S, Kamaruzzaman S, Rakmi A.R. (2002) Comprehensive characteristics of the municipal solid waste generation in Kuala Lumpur. In: Proceedings of the regional symposium on environment and natural resources. April. p. 359–68.

[26.] Talyan V, Dahiya R.P, Sreekrishnan T.R, (2008). State of municipal solid waste management in Delhi, the capital of India. Journal of Waste Management;28:1276–87.

[27.] TCHOBANOGLOUS. G, THEISEN H, and VIGIL, S. (1993). Integrated Solid Waste Management: Engineering Principles and Management Issues. McGraw Hill U.S, Pp. 292 – 295.

Neural network approach to power system security analysis

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ABSTRACT:
Contingency analysis of a power system is a major activity in power system planning and operation. In general an outage of one transmission line or transformer may lead to over loads in other branches and/or sudden system voltage rise or drop. The traditional approach of security analysis known as exhaustive security analysis involving the simulation of all conceivable contingencies by full AC load flows, becomes prohibitively costly in terms of time and computing resources.
A new approach using Artificial Neural Network s has been proposed in this paper for real-time network security assessment. Security assessment has two functions the first is violation detection in the actual system operating state. The second, much more demanding, function of security assessment is contingency analysis. In this paper, for the determination of voltage contingency ranking, a method has been suggested, which eliminates misranking and masking effects and security assessment has been determined using Radial Basis Function (RBF) neural network for the real time control of power system. The proposed paradigms are tested on IEEE 14 – bus and 30 – bus systems.

Key words: *Input here the part of 4-5 keywords.*

I. INTRODUCTION

Security refers to the ability of the system to withstand the impact of disturbance (contingency). The system is said to be secure if no security limit is seriously violated in the event of contingency. The process of investigating whether the system secure or insecure in a set of proposed contingencies is called *Security Analysis*.

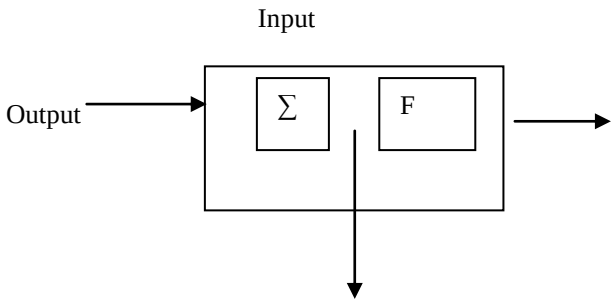
The three basic elements if real-time security analyses are, Security monitoring, Security assessment. The problem of predicting the static security status of a large power system is a computationally demanding task [2] and it requires large amount of memory. In online contingency analysis, it has become quite common to screen contingencies by ranking them according to some severity index. Which is calculated solely as a measure of limit violations?. The methods developed are known as "ranking methods". In this paper, for the determination of voltage contingency ranking, a method has been suggested, which eliminates misranking and masking effects and security assessment has been determined using Radial Basis Function (RBF) neural network for the real time control of power system. The proposed paradigms are tested on IEEE 14-bus and 30-bus systems.

II. ARTIFICIAL NEURAL NETWORKS

Artificial neural networks (ANN) are massively parallel inter connected networks of simple elements known as artificial neurons and their connectivity is intended to interact with the objects of real world, in a similar manner as the biological nerves systems do.

The simple neuron model is shown in fig(a). $\sum$ unit multiplies each input 'x' by a weight 'w' and sums the weighted inputs. The output of the figure is

NET = x1w1 + x_2w_2 + ….+x_nw_n : OUT = f(NET)



2.1) Basic features of ANNs are:

1. High computational rates due to the massive parallelism.
2. Fault tolerance.
3. Training the network adopts itself, based on the information received from the environment
4. Programmed rules are not necessary.
5. Primitive computational elements.

2.2) Radial basis function networks:

The Radial Basis Function is similar to the Gaussian function, which is defined by a center and a width parameter. The Gaussian function gives the highest output when the incoming variables are closest to the center apposition and decreases monotonically as the rate of decrease.

Where X = an input vector

u_i = weight of vector of hidden layer neuron I

$D_i^2 = (x - u_i)^r (x - u_i)$, x and u are column vectors

The weights of each hidden layer neuron are assigned the values of input training vector. The output neuron produces the linear weighted summation of these,

$y = \sum h_i w_i$

Where wi = weight in the output layer

III. NETWORK OPERATION

The network has two operating modes, named, training and testing. During training the adjustable parameters of the network (u_i, σ_i and output layer matrix w) are set so as to minimize the average error between the actual network output and desired output over the vectors in a training set. In the testing phase, input vectors are applied and output vectors are produced by the network.

IV. TRAINING OF THE RBF NETWORK

A) Computation of RBF parameters:

1). Initialize the center of each cluster to a randomly selected training pattern.
2). Assign each training pattern to the nearest cluster. This can be accomplished by calculating the Euclidean distances between the training patterns and the cluster centers.
3). When all the training patterns are assigned, calculate the average position for each cluster center. Then they become new cluster centers.
4). Repeat steps (2)and (3) until the cluster centers do not change during the subsequent iterations.

b).Calculation of RBF unit widths

When the RBF centers have been established, the width of each RBF unit can be calculated. The width of any RBF unit selected as the root mean square distance to the nearest p, RBF units, where p is a design parameter for the RBF network. For the unit I, it is given by

$$\sigma_i = \left[\frac{1}{p} \sum_{j=1}^{p} \sum_{k=1}^{r} (X_{ki} - X_{kj})^2 \right]^{1/2}$$

Where X_{ki} and X_{kj} are the k^{th} entries of the centers of i^{th} and j^{th} hidden units.

c).Calculation of activation
The activation level O_j of hidden unit j is $O_j = \exp [- (X – W_j)^2/2\sigma^2_j]$
The activation level O_k of an output is determined by $O_k=\sum W_{ji}O_j$
d) Weight learning:
a) Adjust weights in the hidden layer by clustering algorithm. In the output layer adjust weights by
$W_{ji}(t+1) = W_{ji}(t) + \Delta W_{ji}$
Where $W_{ji}(t)$ is the weight from the unit I to j at the time t (or the t iteration) and ΔW_{ji} is the weight adjustment.
b) The weight change is calculated by $\Delta W_{ij} = \eta\delta_j O_i$
Where η is a trail independent training rate and δ_j is the error at unit j.
$\delta_j = T_j - O_j$
Where T_j is the desired (or target) output activation at the output unit j.
d).Repeat iterations unit convergence.

V. STATIC SECURITY ASSESSMENT USING RBF NETWORK:

A).On-line security analysis:

There are three basic elements of on-line security analysis and control, namely, monitoring assessment and control. They are tied together in the following framework.

Step-1) Security monitoring :

Using real-time systems measurements. Identify whether the system is in the normal state or not. If the system is in an emergency state, go to step-(4). If load has been lost, go to step-(5).

Step-2) Security Assessment:

If the system is in the normal state, determine whether the system is secure or insecure with respect to a set of next contingencies.

Step-3) Emergency controls:

Execute proper corrective action to bring the system back to the normal back to the normal state following a contingency which causes the system to enter an emergency state. This is sometimes called remedial action.

Step-5) Restorative Control:
Restore service to system loads

VI. PROPOSED RBF BASED SECURITY ASSESSMENT:

A).Real-power security assessment:

For the computation of Real-power security, the real power flows (P_{ij}) are calculated for each outage of the line or transformer or generator using Newton-Raphson load flow study. If any(contingency) line is violating the limits of the base cases line flows, it is labeled as insecure case(0) and if all the line flows (contingency) are within the limits of base case flows are labeled as secure case(1).
$P_{ij} = -V_i^2G_{ij} + V_iV_jY_{ij}\text{Cos} (\upsilon ij + \delta j - \delta i)$
Where P_{ij} = real power flow between buses i and j
V_i = voltage at bus I; V_j = voltage at bus j
V_{ij} = admittance between bus i and j
G_{ij} = conductance between bus i and j
Y_{ij} = admittance angle, δ = phase angle.

VII. SIMULATION RESULTS

The training and testing of RBF network has been carried out, for IEEE 14-bus and IEEE 30-bus systems. The training patterns were generated for base case and different network outages using a Newton-Raphson load flow program by varying the loads at each bus randomly covering the whole range of operating

condition up to 110% of the base case loading value. For each power system total 100 patterns were generated. Out of these, 75 patterns were used to train the RBF network and remaining 25 patterns were used to test the accuracy and robustness of the trained RBF network. RBF networks were designed for the real-power security and voltage security, for accurate classification of secure or insecure cases.

Voltage and real power security:

The number of input nodes, output nodes for the IEEE 14-bus and IEEE 30-bus systems are given in the table 4.1 . The number of clusters of the input patterns, the number of hidden nodes are found to be optimum and resulted to accurate results. The learning rate (η) is taken as 0,5. Both the power systems have one output node, only as it represents the secure or insecure state of the system.

After training RBF network it has been tested for the novel pattern corresponding to different loading conditions. RBF network has been designed for the real power security assessment as well as voltage security assessment for better generalization.

VIIICONCLUSIONS

In this paper power system static security assessment has been investigated. The test results presented on IEEE 14-bus system and IEEE 30-bus system provides the following observations.

a) A new method has been reported for calculating voltage performance index for contingency ranking. Which eliminates misranking and masking problems? Ranking of all contingencies is same irrespective of values of weights supplied.
b) The RBF neural network model provides more accurate results for both the security and insecurity cases.
c) Training is very fast as the RBF network has the capability of handling large date
d) Testing time is less than 0.2 micro sec.

Strength, Corrosion correlation of thermochemically treated low carbon value-added steel

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Abstract:

In recent times it is very difficult to get only low carbon plain carbon steel. There are always some alloying elements associated with it and are known as value added steel. The effects of different types of chemical heat treatment on such steels have been studied to evaluate how far these steels can be used in those applications where high surface hardness and good corrosion properties are required.

I. INTRODUCTION

Thermo chemical treatment enables hard and wear resistant outer surface in ductile and tough steels. Of the three methods of carburizing, viz., pack, liquid and gas, liquid carburizing is one the most commercially practiced carburizing process. In this process carburizing occurs through molten cyanide (CN) in low carbon cast steel pot type furnace heated by oil or gas. Bath temperature is maintained between 815^{o}C and 900^{o}C. The bath surface is covered with graphite or coal to reduce radiation losses and excessive decomposition of cyanide. Besides sodium or potassium cyanide, the bath contains sodium and potassium chlorides and barium chloride, which act as activator[1]. Nitriding is done in a molten salt bath employing a temperature range of 510^{o}C to 580^{o}C.Unlike liquid carburizing and cyaniding, which employs baths of similar compositions, liquid nitriding is a sub critical case hardening process; thus processing of finished parts is possible because dimensional stability can be maintained. Also, liquid nitriding adds more nitrogen and less carbon to ferrous materials than that obtained through higher-temperature diffusion treatments[2]. While carburizing and nitriding have their respective applications other combinations of these two processes are carbonitriding and nitrocarburizing[3], each having a few characteristic applications of their own. All these processes are one-step process where depending upon selection of processing parameters there will be variations in degree of penetration of carbon and nitrogen in the case. In the present work effect of nitriding after carburizing and vice a versa on strength and corrosion properties on value added low carbon steel has been studied.

II. EXPERIMENTAL

Composition of the value added low carbon steel used for experiments is given in table1. Thin samples of 3m thickness were pack carburized at 950^{o}C and 900^{o}C in a steel box by taking charcoal powder and $BaCO_3$ in the ratio 9:1 by weight for 10 hours. Nitriding of the samples was done at 560^{o}C for 8 and 16 hours in liquid nitriding bath containing 96.5% NaCN, 2.5% Na_2CO_3 and about 1% NaCNO. Before nit riding, the samples were preheated to 300^{o}C for 45 minutes. A few carburized samples were nitrided while a few nitrided samples were carburized as per the details given in table2.

Tensile testing of flat specimens of thickness 3mm was done in UTM INSTRON machine using a ramp rate of 0.6 mm/min. Tensile and Microhardness data are given in table 3. To assess of surface modification due to the chemical heat treatment micro hardness rather than macro hardness were taken. Corrosion rates of the samples in NACE solution were experimentally found by conducting potentiostatic polarization tests using three-electrode system. Tafel extrapolation method was employed to estimate corrosion rates. Corrosion data are given in table 4. Microstructures of the samples are given in figures 1 - 12. XRD of the samples were done using Ultima II of Rigaku to identify the different microconstituents. The summery of XRD analysis is given in table 5. SEM was done to see the topographical changes that resulted after the different treatments. SEM photographs are given in figures 13 –18.

III. DISCUSSION

Amount of pearlite and carbides increased with carburizing temperature (figs.2 - 3) and grain refining is observed with nitriding time (figs. 4 - 5). Nitriding after carburizing causes some amount of decarburizing (figs 6 – 9) but figs. 6 - 7 exhibits better nitriding, which are carburized at 950^{o}C. Similarly, carburizing after nitriding results in denitriding (figs. 10 – 12). However carburizing of samples, which were nitrided for longer time, shows somewhat better carburizing. Table 5 reveals that many carbides, Fe_2C and FeC and Fe_3N formed on the case. Traces of few metal oxides and oxalates were also detected which proves that the surface of the specimen was oxidized in the process of carburizing. But no significant oxides could be detected in nitrided samples. Surface topography (figs.13 - 18) shows a wide variation due to formation of carbides and nitrides. Carburized followed by nitrided samples showed homogeneous structure.

Microhardness data as given in table 3 shows that the surface hardness of nitrided samples is higher than those of carburized and as received samples. Surface hardness of carburized samples is higher than that of mild steel. The increase in microhardness is due to the diffusion of carbon and formation of pearlite and various carbides as is seen for microstructures of carburized and grain size reduction in nitrided samples respectively. Surface hardness increased when the samples were nitrided after carburizing due to reduction in grain size and also due to formation of nitrides. However, microhardness of the samples decreased when the nitrided samples were further carburized. The decrease is due to removal of nitrided layer and formation of pearlito-carbidic matrix. The microhardness of the sample that was carburized at 950^{o}C followed by nitriding for 16 hours is highest due to large amount of pearlite and cementite formed and also due to grain refinement. Surface hardness as high as 612.4 HVN is obtained which is comparable to materials with very high hardness.

From Table 2 it is seen that tensile strength increases after carburizing, nitriding and combination of two due to diffusion of carbon and nitrogen at the surface but ductility decreases as less time is required for fracture as compared to the as received sample. The tensile strength of nitrided samples was highest and their ductility were lowest. The as received sample and carburized sample undergo ductile failure showing good amount of necking. In contrast the nitrided sample shows brittle failure. Percentage elongation data also supplement this. The tensile strength of nitrided samples decrease but ductility increases after further carburizing, as the surface is denitrided. The tensile strength of carburized samples increases after further nitriding but ductility decreases. Carburized samples followed by nitriding showed best tensile properties. This is probably due to the development of right combination of pearlitic carbide and nitride. Carburized at 950^{o}C followed by nitriding for 16 hours gives highest tensile strength and ductility was more than that of just nitrided sample.

From the E_{CORR} and I_{CORR} values as estimated by Tafel extrapolation method and presented in table 4 it can be seen that corrosion rate of carburized samples was lower than that of mild steel. Corrosion rate of nitrided samples are lower than the carburized samples. Between the carburized samples corrosion rate of the sample carburized at lower temperature was found to be even lower. Similarly corrosion rate of the sample nitrided for smaller length of time is lower. Corrosion resistance property of the sample that was nitrided followed by carburizing is found to be best. Where as samples those were carburized followed by nitriding gives poor corrosion resistance but better than just carburized or nitrided samples. Decrease in corrosion resistance in nitrided samples is due to the formation of Fe_3N and further decrease of corrosion resistance when nitrided samples are carburized is due to the formation of Fe_3N and Fe_2C. Poor corrosion resistance of carburized samples is due to the oxidation of the surface. Grain refined structure of just nitrided samples is responsible for poor corrosion resistance.

CONCLUSION

1. Carburized samples followed by nitriding show better tensile property, better strength and ductility retained significantly.
2. Corrosion resistance of samples those were nitrided followed by carburizing were superior.
3. Optimum combination of all the properties for the treatment, which comprised of Carburizing at 950^{o}C followed by nitriding for 16 hours.

REFERENCES

[1.] Azaroff, Introduction to Solids, TMH, 1960/77, pages 187-203
[2.] Knowledge Article, http//www.key-to-steel.com
[3.] APT Materials Handbook, TPO-P00-MDD-X-00001, 20001

Table 1 Composition of the sample

Sample No	Treatment
1	Mild steel
2	Carburized 950º C for 10 hrs
3	Carburized 900º C for 10 hrs
4	Nitrided 16 hrs at 550 ºC
5	Nitrided 8 hrs at 550 ºC
6	Carburized at 900ºC followed by Nitrided 8 hrs
7	Carburized at 900ºC followed by Nitrided 16 hrs
8	Carburized at 950º C followed by Nitrided 8 hrs
9	Carburized at 950º C followed by Nitrided 16 hrs
10	Nitrided for 8 hrs followed by Carburized at 900º C
11	Nitrided for 16 hrs followed by Carburized at 900º C
12	Nitrided for 8 hrs followed by Carburized at 950º C
13	Nitrided for 16 hrs followed by Carburized at 950º C

Elements	C	Si	Mn	P	S	Cr	Mo	Ni	Balance iron
Percent Composition	0.1183	0.019	0.902	0.0192	0.0007	0.0432	0.0158	0.0294	98.591

Table 2 Treatment Details

Table 3 Mechanical Properties

Sl. No	Sample	UTS (kN/mm^2)	Yield strength (kN/mm^2)	% elongation ($(L-L_0)/L_0$)	Microhardness In HVN
1	As received	0.61	0.52	12.2	254.5
2	Carburized 950º C	0.63	0.50	5.75	311.5
3	Carburized 900º C	0.62	0.44	5.82	324.8
4	Nitrided 16 hrs	0.80	0.75	1.40	410.5
5	Nitrided 8 hrs	0.78	0.72	1.35	475.4
6	Carburized at 900ºC followed by Nitrided 8 hrs	0.53	0.51	2.24	539.2
7	Carburized at 900ºC followed by Nitrided 16 hrs	0.55	0.52	3.16	596.5
8	Carburized at 950º C followed by Nitrided 8 hrs	0.56	0.53	3.42	596.2
9	Carburized at 950º C followed by Nitrided 16 hrs	0.80	0.76	1.82	612.4
10	Nitrided for 8 hrs followed by Carburized at 900º C	0.64	0.49	3.45	408.2
11	Nitrided for 16 hrs followed by Carburized at 900º C	0.68	0.51	2.52	441.9
12	Nitrided for 8 hrs followed by Carburized at 950º C	0.66	0.50	2.91	426.4
13	Nitrided for 16 hrs followed by Carburized at 950º C	0.70	0.52	2.30	479.9

Table 4: Corrosion Data

Sl. No	Sample	$I_{CORR\ IN}$ mA/sq.cm	E_{CORR} in volts vs, SCE
1	Mild steel	0.00800	-2.05
2	Carburized 950º C	0.00310	0.50
3	Carburized 900º C	0.00220	0.40
4	Nitrided 16 hrs	0.00032	0.39
5	Nitrided 8 hrs	0.00030	0.40
6	Carburized at 900ºC followed by Nitrided 8 hrs	0.00029	0.32
7	Carburized at 900ºC followed by Nitrided 16 hrs	0.00025	0.24
8	Carburized at 950º C followed by Nitrided 8 hrs	0.00026	0.22
9	Carburized at 950º C followed by Nitrided 16 hrs	0.00028	0.23
10	Nitrided for 8 hrs followed by Carburized at 900º C	0.00018	0.10
11	Nitrided for 16 hrs followed by Carburized at 900º C	0.00026	0.12
12	Nitrided for 8 hrs followed by Carburized at 950º C	0.00020	0.18
13	Nitrided for 16 hrs followed by Carburized at 950º C	0.00028	0.13

Table 5: XRD Data

Treatment	Peaks observed
As Received	α-Fe, FeC
Carburized 950º C	α-Fe, FeC, $C_6Fe_2O_{12}$, FeO_2CO_3
Nitrided 16 hrs	α-Fe, Fe_3N, Iron Manganese Nitricle
Carburized 950º C Nitrided 16 hrs	α-Fe, Fe_3N, Fe_2C
Carburized 950º C Nitrided 8 hrs	α-Fe, Fe_3N, Fe_2C, FeC
Nitrided 16 hrs Carburized 950º C	α-Fe, FeO_2CO_3, Iron Manganese Nitricle, Fe_2C

Microstructures of Different sample

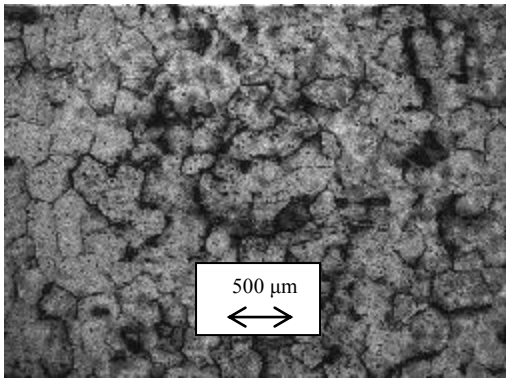

Fig 1. As Received

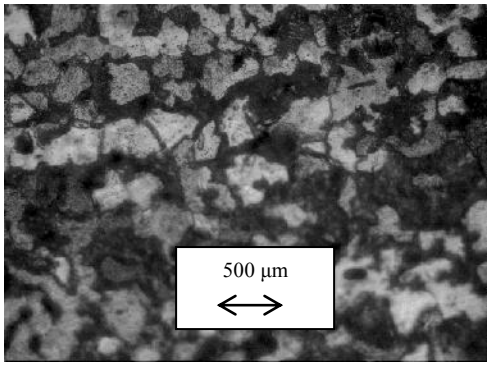

Fig 2.Carburized 900˚C

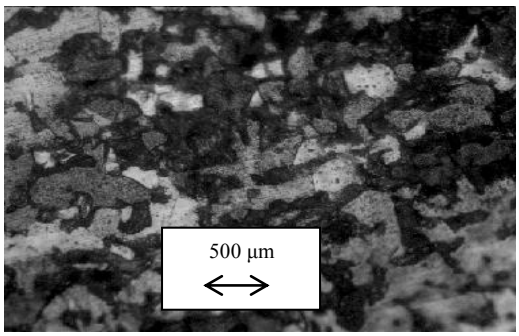

Fig 3.Carburized 950˚C

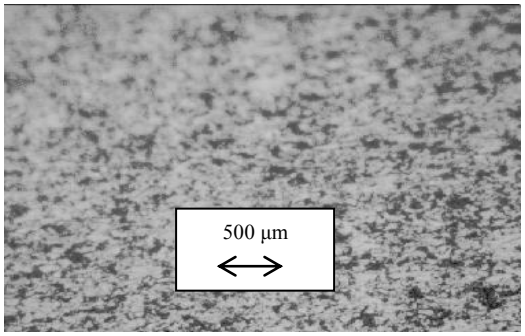

Fig 4.Nitrided 16 hrs

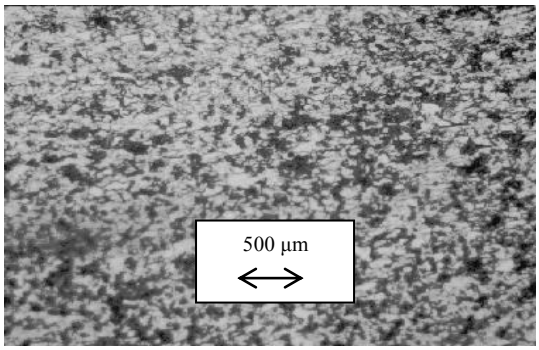

Fig 5.Nitrided 8 hrs

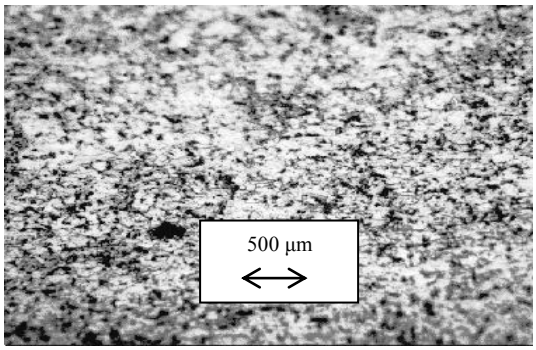

Fig 6. Carburized 950˚C Nitrided 16 hrs

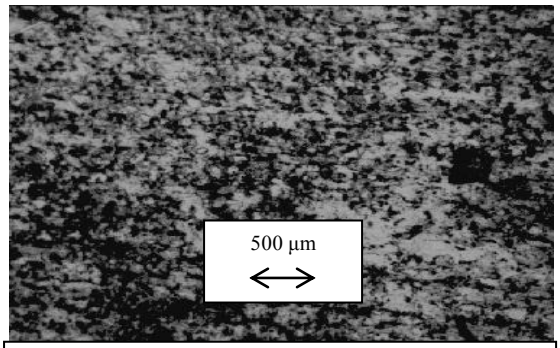

Fig 7. Carburized 950˚C Nitrided 8 hrs

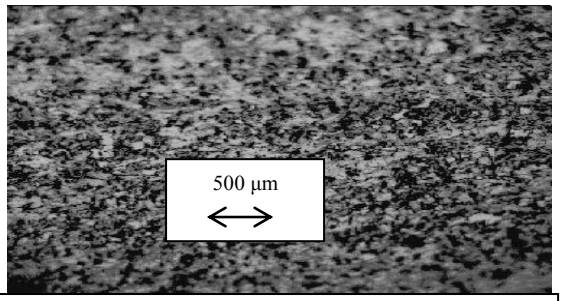

Fig 8.Carburized 900˚C Nitrided 16 hrs

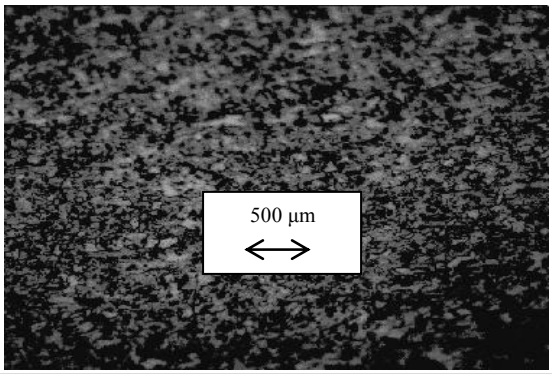

Fig 9.Carburized 900˚C Nitrided 8 hrs

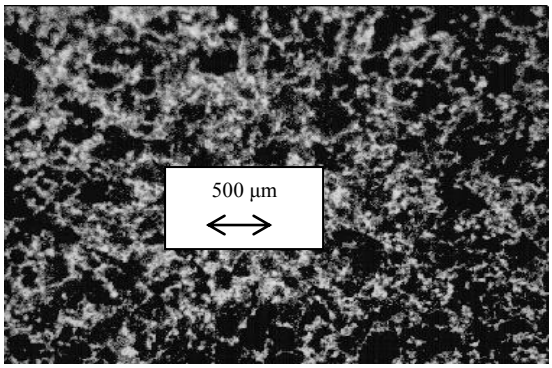

Fig 10 Nitrided 16 hrs Carburized 950˚C

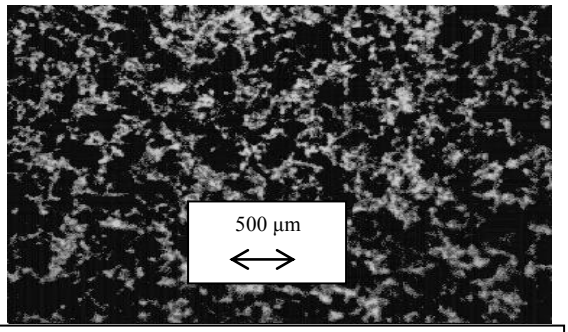

Fig 11 Nitrided 16 hrs Carburized 900˚C

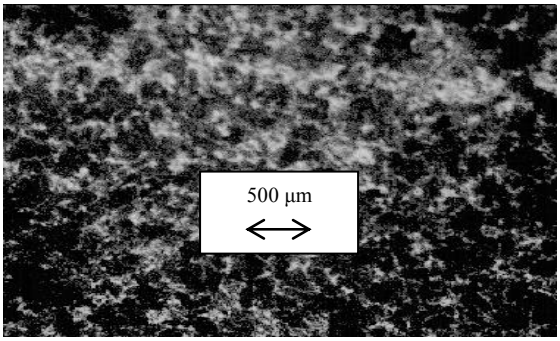

Fig 12. Nitrided 8 hrs Carburized 950˚C

SEM photographs

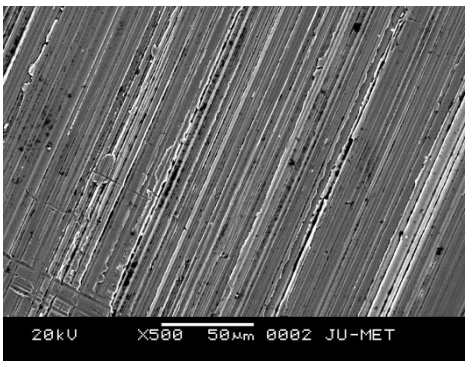

Fig-13 Mild steel 0.2%C

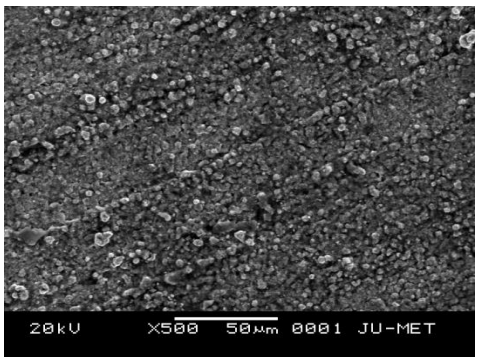

Fig-14 Carburized 950º C

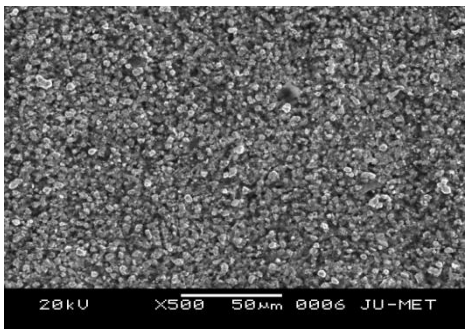

Fig-15 Carburized 950ºC Nitrided 8

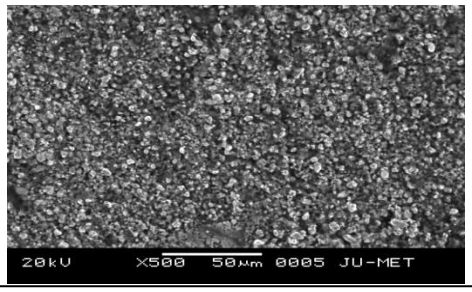

Fig-16 Carburized 950ºC Nitrided 16 hrs

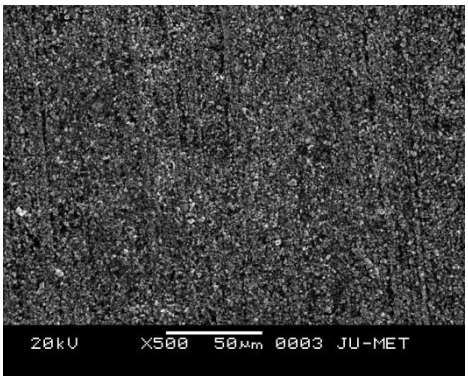

Fig-17 Nitrided 16 Hrs

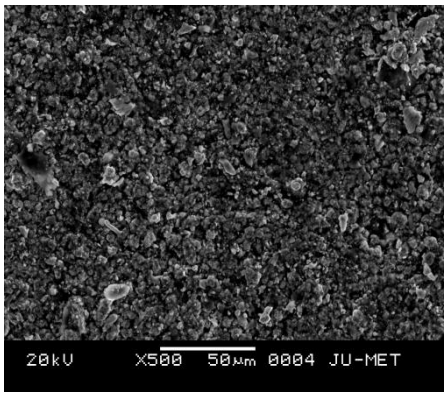

Fig-18 Nitrided 16 Hrs Carburized 950ºC

Mutual Funds and SEBI Regulations

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ABSTRACT:
A Mutual Fund is a form of collective investment that pools money from many investors and invests the money in stocks, bonds, short-term money market instruments, and/or other securities. Now a day's these Mutual funds are very popular because they provide an excellent way for anyone to direct a portion of their income towards a particular investment. In order to help the small investors, mutual fund industry has come to occupy an important place. Mutual funds provide an easy way for small investors to make long-term, diversified, professionally managed investments at a reasonable cost. The purpose and objective of this article is to study meaning and nature of Mutual funds, procedure, importance of SEBI and its mechanism in India, and also examine the growth of mutual funds and analyze the operations of mutual funds and suggest some measures to make it a successful scheme in India.

Keywords: *Mutual Fund, Investment, Long Term, Short Term, Investor, Securities, SEBI.*

I. INTRODUCTION:

A Mutual Fund is a form of collective investment that pools money from many investors and invests the money in stocks, bonds, short-term money market instruments, and/or other securities. In a Mutual Fund, the fund manager trades the fund's underlying securities, realizing capital gains or loss, and collects the dividend or interest income.

The investment proceeds are then passed along to the individual investors. The value of a share of the Mutual Fund, known as the net asset value (NAV), is calculated daily based on the total value of the fund divided by the number of shares purchased by investors.

Mutual funds enable hundreds, and in some cases even millions, of investors to pool their money together in order to make investments. Investors in Mutual Funds entrust their investment decisions to a professional money manager and his/her staff. Most Mutual Funds have clearly defined investment practices and objectives for their investments. With nearly 10,000 different funds now available, there is most likely a fund that will cater to just about any investment objective you might have.

In above figure it show the stages that how the process of investment start from investors and end with investors and how the fund manger generate money from securities and profit get from investment .

Mutual funds can be broken down into two basic categories: equity and bond funds. Equity funds invest primarily in common stocks, while bond funds invest mainly in various debt instruments. Within each of these sectors, investors have a myriad of choices to consider, including: international or domestic, active or indexed, and value or growth, just to name a few. We will cover these topics shortly. First, however, we're going to focus our attention on the "nuts and bolts" of how mutual funds operate.

II. WHY ARE MUTUAL FUNDS SO POPULAR?

Mutual funds provide an easy way for small investors to make long-term, diversified, professionally managed investments at a reasonable cost. If an investor only has a small amount of money with which to invest, then he/she will most likely not be able to afford a professional money manager, a diversified basket of stocks, or have access to low trading fees. With a Mutual Fund, however, a large group of investors can pool their resources together and make these benefits available to the entire group. There are no "perks" for the largest investor and no penalties to the smallest--all Mutual Fund holders pay the same fees and receive the same benefits.

Mutual funds are also popular because they provide an excellent way for anyone to direct a portion of their income towards a particular investment objective. Whether you're looking for a broad-based fund or a narrow industry-focused niche fund, you're almost certain to find a fund that meets your needs.

If you look in history of Indian Mutual Fund the UTI mutual fund is the first Mutual Fund comes in 1963. Unit Trust of India (UTI) was established in 1963 by an Act of Parliament control by the reserve bank of India. There was governing by the Reserve Bank of India and functioned under the Regulatory and administrative control of the Reserve Bank of India. In 1978 UTI was de-linked from the RBI and the Industrial Development Bank of India (IDBI) took over the regulatory and administrative control in place of RBI. Body was reserve bank of India .but in 1993 constituted of securities and exchange board of India(SEBI) The SEBI (Mutual Fund) Regulations were substituted by a more comprehensive and revised Mutual Fund Regulations in 1996. The industry now functions under the SEBI (Mutual Fund) Regulations 1996.

For the purpose of research, the project has been divided into ten Chapters. In the first chapter the concept of mutual fund. The second chapter is relating to the History of mutual fund and the origin of mutual fund in America and how mutual fund spread in whole word. And how mutual fund concept came in to exist in India. In third chapter I discussed about today's mutual fund industry in India. In fourth chapter I discussed the advantages and disadvantages of mutual fund. Then in fifth chapter how mutual fund makes money from securities market. Then in sixth chapter I discussed about standard offer document of mutual fund. In seventh chapter I discussed about risk management in mutual fund and what is role of risk management in mutual fund and in last chapter conclusion and some cases of mutual fund.

III. SEBI (MUTUAL FUND) REGULATIONS 1996:

In exercise of the powers conferred by section 30 of the Securities and Exchange Board of India Act, 1992, the Board, with the previous approval of Central Government, makes regulations relating to regulation of mutual fund. Chapter I of regulations is the preliminary, R. 1 contains sort title, application and commencement and R 2 deals with definitions. Chapter II deals with registration of mutual fund. Chapter III of regulations discuss about the constitution and management of mutual fund and operation of trustees etc. chapter IV deals with constitution and management of asset management company and custodian \in chapter v schemes of mutual fund.

Here the following some important definition and word that use in mutual fund.

Money Market Instruments:- includes commercial papers, commercial bills, treasury bills, Government securities having an unexpired maturity up to one year, call or notice money, certificate of deposit, usance bills, and any other like instruments as specified by the Reserve Bank of India from time to time;
Money Market Mutual Fund: - means a scheme of a mutual fund which has been set up with the objective of investing exclusively in money market instruments;
"mutual fund" means a fund established in the form of a trust to raise monies through the sale of units to the public or a section of the public under one or more schemes for investing in securities, including money market instruments [or gold or gold related instruments];
Offer Document: - means any document by which a mutual fund invites public for subscription of units of a scheme;
Open-Ended Scheme: - means a scheme of a mutual fund which offers units for sale without specifying any duration for redemption;
Scheme: - means a scheme of a mutual fund launched under Chapter V;
Schedule: - means any of the schedules annexed to these regulations;
Securities Laws: - means the Securities & Exchange Board of India Act, 1992 (15 of 1992), the Securities Contracts (Regulation) Act, 1956 (42 of 1956) and the Depositories Act, 1996 (22 of 1996) including their amendments and such other laws as may be enacted from time to time;

Sponsor: - means any person who, acting alone or in combination with another body corporate, establishes a mutual fund;
Trustee: - means the Board of Trustees or the Trustee Company who hold the property of the Mutual Fund in trust for the benefit of the unit holders.]
Unit: - means the interest of the unit holders in a scheme, which consists of each unit representing one undivided share in the assets of a scheme;
Unit Holder: - means a person holding unit in a scheme of a mutual fund.
Application for Registration: - An application for registration of a mutual fund shall be made to the Board in Form A by the sponsor

IV. ELIGIBILITY CRITERIA:

For the purpose of grant of a certificate of registration, the applicant has to fulfill the condition that the sponsor should have a sound track record and general reputation of fairness and integrity in all his business transactions. in the case of an existing mutual fund, such fund is in the form of a trust and the trust deed has been approved by the Board. The sponsor has contributed or contributes at least 40% to the net worth of the asset management company.

V. TRUST DEED TO BE REGISTERED UNDER THE REGISTRATION ACT:

A mutual fund shall be constituted in the form of a trust and the instrument of trust shall be in the form of a deed, duly registered under the provisions of the Indian Registration Act, 1908 (16 of 1908) executed by the sponsor in favor of the trustees named in such an instrument.

VI. APPOINTMENT OF AN ASSET MANAGEMENT COMPANY:

The sponsor or, if so authorized by the trust deed, the trustee shall, appoint an asset management company, which has been approved by the Board. The appointment of an asset management company can be terminated by majority of the trustees or by seventy five per cent of the unit-holders of the scheme. Any change in the appointment of the asset management company shall be subject to prior approval of the Board and the unit holders.

VII. APPOINTMENT OF CUSTODIAN:

The mutual fund shall appoint a custodian to carry out the custodial services for the schemes of the fund and sent intimation of the same to the Board within fifteen days of the appointment of the custodian. 38* "Provided that in case of a gold or gold exchange traded fund scheme, the assets of the scheme being gold or gold related instruments may be kept in custody of a bank which is registered as a custodian with the Board. No custodian in which the sponsor or its associates hold 50% or more of the voting rights of the share capital of the custodian or where 50% or more of the directors of the custodian represent the interest of the sponsor or its associates shall act as custodian for a mutual fund constituted by the same sponsor or any of its associate or subsidiary company.

VIII. PROCEDURE FOR LAUNCHING OF SCHEMES:

No scheme shall be launched by the asset management company unless such scheme is approved by the trustees and a copy of the offer document has been filed with the Board. Every mutual fund shall along with the offer document of each scheme pay filing fees as specified in the Second Schedule.

IX. WINDING UP:

A close-ended scheme shall be wound up on the expiry of duration fixed in the scheme on the redemption of the units unless it is rolled-over for a further period under sub-regulation (4) of regulation 33.
A scheme of a mutual fund may be wound up, after repaying the amount due to the unit holders, -
(a) On the happening of any event which, in the opinion of the trustees, requires the scheme to be wound up; or
(b) If seventy five per cent of the unit holders of a scheme pass a resolution that the scheme be wound up; or
(c)If the Board so directs in the interest of the unit-holders.

(3) Where a scheme is to be wound up under sub-regulation (2), the trustees shall give notice disclosing the circumstances leading to the winding up of the scheme: -
(a) To the Board; and (b) In two daily newspapers having circulation all over India, a vernacular newspaper circulating at the place where the mutual fund is formed.

X. TO MAINTAIN PROPER BOOKS OF ACCOUNTS AND RECORDS, ETC.:

(1) Every asset management company for each scheme shall keep and maintain proper books of accounts, records and documents, for each scheme so as to explain its transactions and to disclose at any point of time the financial position of each scheme and in particular give a true and fair view of the state of affairs of the fund and intimate to the Board the place where such books of accounts, records and documents are maintained.

(2) Every asset management company shall maintain and preserve for a period of [eight] years its books of accounts, records and documents.

(3) The asset management company shall follow the accounting policies and standards as specified in Ninth Schedule so as to provide appropriate details of the scheme wise disposition of the assets of the fund at the relevant accounting date and the performance during that period together with information regarding distribution or accumulation of income accruing to the unit holder in a fair and true manner.

XI. CONCLUSION:

Mutual fund have three tier –structure; a sponsor, an asset management company and a trustee company. The board of director of the AMC and the board of the trustee company are the two key levels of check and balance to safeguard the interest of the investors. Periodic report–weekly and monthly have to be provided by the AMC to the trustee company and by both to SEBI .such a structure is also intended to keep the fund operations within the confines of the law.

The SEBI has recently put up the report titled; reform of mutual fund industry prepared in association with A.F. Ferguson and company for public comments. In a press release SEBI pointed out that asean development bank on behalf of the finance government of India appointed a consultant to review the various aspects of the mutual fund industry in India. Inviting public comments /view report SEBI has noted that SEBI neither approves nor disapproves content accuracy of the report.

The report noted that the ownership of Indian mutual fund is dominated by corporation which it is estimated account for between 60 to 80 % of the total value of assets under management .this has led to practice like dividend stripping or offering a favorable NAV pricing for instance that knew towards these investor s. as a result the turnover of mutual fund units has reached epic proportion. sales and redemption of units as a % of average NAV stands at 4.28 times compared to 0.38 ND 0.51 times for mutual fund in UK and US respectively .because of this the portfolio turnover of the scheme is high than portfolio turnover as a % of average NAV was more than 10 times in 2001-02 the highest being 14.65 times.

The regulation governing mutual fund have been developed over time and are fairly comprehensive .this development has been through periodic amendments to the regulation themselves and also through a continuous series of notification and circulars issued by SEBI. There is thus no unified corpus of regulation that is easy to grasp.

In the light of recommendation of mutual fund it seemed to make some appropriate to reconstruct the regulation as they would apply to AMCs, PTCs and to mutual fund themselves .each set should be designed to be comprehensive and classified clearly under various heads. Whenever a change is effected in order to meet new circumstances or to tighten investors protection then the relevant chapter should be replaced so that at all times the handbook is up to date and whatever guidance is required on all matters relating to compliance is available at once place. There should prepare a series of models and have reviewed key issues with SEBI. the some improvement in the regulation that committee felt that there were gaps or weaknesses or where the regulation to be brought up to best international standard .they have been drafted as if the detailed recommendation made had been accepted.

In regulatory authority SEBI has built up its capability over a period of time and appear to be supervising the mutual fund as well as it can. Some recommendations are like this

i. The AMC should be more directly supervised by SEBI as opposed to the significant reliance now placed on sponsor's trustees. With the introduction of PTC –SEBI will need to supervise these as well.
ii. A more hands –on approach to supervision should be adopted.
iii. A selective or risk based inspection routine should be adopted whereby the historically more compliant mutual fund are inspected less frequently than the less compliant smaller or newer mutual funds.
iv. Personnel with more hands on industry experience should ideally be recruited .if this proves difficulty then a system of secondment to the industry could be considered for SEBI personnel to acquire the hands –on experience .
v. The system of job rotation followed by SEBI resulted in experienced personnel being moved into other areas .SEBI should try and see if long term career prospects can be achieved its executives by promote in within the same division .

REFERENCES

[1] www.amfiindia.com
[2] www.finance@indiaMATE.com
[3] Mary Rowland," The New Commonsense Guide to Mutual Fund",pp-165-170,vision publication, delhi,1998
[4] www.sebi.gov.org
[5] SEBI (Mutual Funds) Regulations, 1996.
[6] Following clause "y" in regulation 2 was substituted by SEBI (Mutual Fund) (Amendment) Regulations, 1999 published in the Official Gazette of India dated 08.12.1999
[7] Regulation 7 of SEBI (Mutual Fund) Regulations, 1996.
[8] Regulation 21of SEBI (Mutual Funds) Regulations, 1996.
[9] Regulation 26 and Proviso inserted by the SEBI (Mutual Fund) (Amendment) Regulations, 2006, published in the Official Gazette dated 12.01.2006
[10] Regulation 26 0f SEBI (Mutual Fund) Regulations, 1996.
[11] "sub-regulation (1) or" deleted by the SEBI (Mutual Fund) (Amendment) Regulations, 1998, published in the Official Gazette of India dated 12.01.1998
[12] Regulation 39 of SEBI (Mutual Fund) Regulations, 1996.
[13] Substituted for "ten years" by SEBI (Mutual Fund) (Amendment) Regulations, 1998, published in the Official Gazette dated 12.01.1998.
[14] Regulation 50 of SEBI (Mutual Fund) Regulations, 1996. Substituted for "ten years" by SEBI (Mutual Fund) (Amendment) Regulations, 1998, published in the Official Gazette dated 12.01.1998.

Integral solution of the biquadratic Equation

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ABSTRACT:
We obtain infinitely many non-zero integer quadruples (x, y, z, w) satisfying the biquadratic equation with four unknowns $x^4 - y^4 = (k^2+1)(z^2 - w^2)$. *Various interesting relations between the solutions, polygonal numbers, pyramidal numbers and centered pyramidal numbers are obtained.*

Keywords: *Biquadratic equations with four unknowns, integral solutions, special numbers, figurative numbers, centered pyramidal numbers*

MSC 2000 Mathematics subject classification: 11D25

Notations:

$Gno_n = 2n - 1$ - Gnomonic number.

$S_n = 6n(n-1) + 1$ -Star number of rank n.

$J_n = \frac{1}{3}\left(2^n - (-1)^n\right)$- Jacobsthal number of rank n.

$j_n = 2^n + (-1)^n$ - Jacobsthal-Lucas number of rank n.

$KY_n = (2^n + 1)^2 - 2$ - Keynea number.

$t_{m,n} = n\left(1 + \frac{(n-1)(m-2)}{2}\right)$ - Polygonal number of rank n with size m.

$P_n^m = \frac{1}{6}n(n+1)((m-2)n + 5 - m)$ -Pyramidal number of rank n with size m.

$OH_n = \frac{1}{3}(n(2n^2+1)$ - Octa hedral number of rank n.

$CP_n^6 = -n^3$ -Centered hexagonal pyramidal number of rank n.

$CP_n^{14} = \frac{n(7n^2-4)}{3}$ -Centered tetra decagonal pyramidal number of rank n.

$PT_n = \frac{n(n+1)(n+2)(n+3)}{4!}$ -Pentatope number of rank n.

$F_{4,n,4} = \frac{n(n+1)^2(n+2)}{12}$ - Four dimensional Figurative number of rank n whose generating polygon is a square

I. INTRODUCTION:

The biquadratic Diophantine (homogeneous or non-homogeneous) equation offer an unlimited field for research due to their varietyDickson.L.E [1],Mordell.L.J[2], Carmichael R.D [3].In particular,one may refer Gopalan M.A et.al[4-17] for non-homogeneous biquadratic equations, with three and four unknowns. This communication concerns with yet another interesting non-homogenous biquadratic equation with four unknowns given by $x^4 - y^4 = (k^2+1)(z^2 - w^2)$ .A few interesting relations between the solutions, special numbers, figurative numbers and centered pyramidal numbers are obtained.

II. METHOD OF ANALYSIS

The non-homogeneous biquadratic diophantine equation with four unknowns is

$$x^4 - y^4 = (k^2+1)(z^2 - w^2) \quad (1)$$

It is worth to note that (1) is satisfied by the following non-zero distinct integer quadruples

$((a^2+b^2)(1+k), (a^2+b^2)(1-k), (a^2+b^2)^2(2k+1), (a^2+b^2)^2(2k-1))$ and

$(10b^2(k-1), -10b^2(k+1), -100\ b^4(2k-1), -100\ b^4(2k+1))$.

However we have some more patterns of solutions to (1) which are illustrated below

To start with,

the substitution of the transformations

$$x = u+v, y = u-v, z = 2uv+\sigma^2, w = 2uv-\sigma^2 \quad (2)$$

in (1), leads to $u^2+v^2 = (k^2+1)\sigma^2$ (3)

2.1 Pattern 1

Let $\sigma = a^2+b^2$ (4)

Substituting (4) in (3) and using the method of factorization, define

$$u+iv = (k+i)(a+ib)^2 \quad (5)$$

Equating real and imaginary parts in (5), we have

$$\left.\begin{aligned} u &= k(a^2-b^2)-2ab \\ v &= (a^2-b^2)+2abk \end{aligned}\right\} \quad (6)$$

Substituting (4) , (6) in (2) and simplifying, the corresponding values of x,y,z and w are represented by

$$x(k,a,b) = k(a^2-b^2+2ab)+(a^2-b^2-2ab)$$

$$y(k,a,b) = k(a^2-b^2-2ab)-(a^2-b^2+2ab)$$

$$z(k,a,b) = 4k^2ab(a^2-b^2)+2k(a^4+b^4-6a^2b^2)-4ab(a^2-b^2)+(a^2+b^2)^2$$

$$w(k,a,b) = 4k^2ab(a^2-b^2)+2k(a^4+b^4-6a^2b^2)-4ab(a^2-b^2)-(a^2+b^2)^2$$

Properties

1. $4\left[z(k,a+1,a)-w(k,a+1,a)-192\ PT_a+96\ T_a^4+24\ PR_a\right]$ is a cubical integer.

2.Each of the following is a nasty number:

(i) 3(z(k,a,b)-w(k,a,b))

(ii) x(k,ka,a)

(iii) -6(x(k,a,a)+y(k,a,a)).

3. $z(k,a,b)+w(k,a,b)-48(k^2-1)P_{a-1}^3+k(32\ P_a^5-48\ F_{4,a,4}-8t_{9,a}+4) \equiv 0 \pmod{28}$

4. $x(k,2^n,1)-y(k,2^n,1)-12\ kJ_n-KY_{2n}+j_{2n} \equiv o \pmod{k}$

5. $x(k,1,b)y(k,1,b)-48\ kP_{b-1}^3 = (k^2-1)(24\ PT_b-9OH_b-t_{19,b}+18\ t_{6,b}-36\ t_{4,b}+1)$

2.2 Pattern2:

(3) is written as

$$u^2+v^2 = (k^2+1)\sigma^2 * 1 \quad (7)$$

Write '1' as

$$1 = \frac{(3+4i)(3-4i)}{25} \quad (8)$$

Using (4) and (8) in (7) and employing the method of factorization, define

$$u+iv = (k+i)\frac{(3+4i)}{5}(a+ib)^2 \quad (9)$$

Equating real and imaginary parts of (9) we get

$$\left.\begin{aligned} u &= \frac{1}{5}((3k-4)(a^2-b^2)-2ab(4k+3)) \\ v &= \frac{1}{5}(2ab(3k-4)+(4k+3)(a^2-b^2)) \end{aligned}\right\} \qquad (10)$$

Taking a=5A,b=5B in (10) and substituting the corresponding values of u,v in (2) the non-zero integral solutions of (1) are Given by

$$x(k,A,B) = 5(k(7A^2-7B^2-2AB)+(-A^2+B^2-14AB))$$

$$y(k,A,B) = 5(k(-A^2+B^2-14AB)+(-7A^2+7B^2+2AB))$$

$$\begin{aligned} z(k,A,B) = 50[&(2k^2(6(A^2-B^2)^2-24A^2B^2-7AB(A^2-B^2)) \\ &-k(7(A^2-B^2)^2-28A^2B^2+96AB(A^2-B^2))- \\ &2(6(A^2-B^2)^2-24A^2B^2-7AB(A^2-B^2))]+(25(A^2+B^2))^2 \end{aligned}$$

$$\begin{aligned} w(k,A,B) = 50[&(2k^2(6(A^2-B^2)^2-24A^2B^2-7AB(A^2-B^2)) \\ &-k(7(A^2-B^2)^2-28A^2B^2+96AB(A^2-B^2))- \\ &2(6(A^2-B^2)^2-24A^2B^2-7AB(A^2-B^2))]-(25(A^2+B^2))^2 \end{aligned}$$

Properties

$$1.x(k,A,1)+y(k,A,1) = 5(k(S_A-20t_{3,A}+2t_{12,A}+4Gno_A-3)+(3CP_A^{14}+7CP_A^6-8PR_A+8))$$

2. $A(y(k,A,A)-x(k,A,A))(3k-4)CP_A^6$

3. $x(k,k,k)+y(k,k,k)+160\,P_k^5 = 20\,t_{4,k}$

4. $2(z(k,A,A)-w(k,A,A))$ is a biquadratic integer.

III. REMARKS

It is worth mentioning here that, instead of (8), one may also consider 1 in general form, as

$$1 = \frac{(p^2-q^2+i2pq)(p^2-q^2-i2pq)}{(p^2+q^2)^2} \qquad \text{(or)}$$

$$1 = \frac{(2pq+i(p^2-q^2))(2pq-i(p^2-q^2))}{(p^2+q^2)^2}$$

Following a similar analysis as in Pattern 2,one can obtain the integral solutions to (1)

Further, instead of (2) one can also use the following transformations

$$(i)\,x = u+v, y = u-v, z = 2u+v\sigma^2, w = 2u-v\sigma^2$$

$$(ii)\,x = u+v, y = u-v, z = 2u\sigma^2+v, w = 2u\sigma^2-v$$

and obtain the corresponding integral solutions to (1)

IV. CONCLUSION:

One may search for other choices of solutions to the equation under consideration and their corresponding properties.

REFERENCES:

[1] Dickson. I. E. ‘’History of the Theory of Numbers’’, Vol 2. Diophantine Analysis, Newyork, Dover, 2005.

[2] Mordell .L J. “ Diophantine Equations’’ Academic Press, New York,1969.

[3] Carmichael. R.D.” The Theory of numbers and Diophantine Analysis’’, NewYork, Dover, 1959.

[4] Gopalan.M.A., Manju Somanath and Vanitha.N.”Parametric Integral Solution of ’’Acta ciencia Indica,Vol.XXXIIIM,No.4,1261-1265,2007.

[5] Gopalan.M.A., Pandichelvi.V.”On ternary quartic Diophantine equation ’’Pacific-Asian Journal of mathematics,Vol.2, No.1-2,57-62,2008.

[6] Gopalan.M.A. Manju somanath and Vanitha.N,”Integral Solutions of ’’ Pure and applied mathematika sciences, Vol.LXIX,No.1-2,149-152,2009.

[7] Gopalan.M.A,Janaki.G, ”Observation on ” Acta ciencia indica,Vol.XXXVM,No2,445- 448,2009.

[8] Gopalan.M.A., Sangeetha.G“Integral solutions of ternary quartic equation ’’Antartica .J.Math.,7(1) 95-101,2010.

[9] Gopalan.M.A.,A.Vijayasankar,.,”Integral solutions of ternary biquadratic equation ’’Impact J.Sci.and Tech.Vol.4,No.3,47-51,2010.

[10] Gopalan,M.A,Vidhyalakshmi.S,Devibala.S,’’Ternary quartic Diophantine equation ’’Impact J.Sci.and Tech,Vol4,No 3,57-60,2010.

[11] Janaki.G Gopalan.M.A.’’Observations on ’’Antartica .J. Math.,7(2),239-245,2010.

[12] Gopalan,M.A and Sangeetha.G’,Integral solutions of ternary non-homogeneous biquadratic equation ’’Acta ciencia Indica, VolXXXVIIM,No.4,799-803,2011.

[13] Gopalan,M.A,Vidhyalakshmi.S.Sumathi.G,’’On the ternary biquadratic non- homogeneous equation Indian journal of engineering,Vol.1,No1,37-40,2012.

[14] Gopalan,M.A,Sumathi.G,Vidhyalakshmi.S,’’Integral solutions of ternary biquadratic non-homogeneous equation ’’ JARCE,Vol.6,No(2).97- 98, 2012.

[15] Gopalan.M.A.Vidhyalakshmi.S Lakshmi.K “On the Biquadratic Equation with Four unknowns IJPAMS Vol.5.No.1,7377,2012

[16] Gopalan,M.A,Sumathi.G,Vidhyalakshmi.S,’’Integral solutions of ternary biquadratic non-homogeneous equation ’’Archimedes J.Math,Vol.3(1),67-71.2013.

[17] Gopalan M.A.,Vidhyalakshmi.S,Lakshmi.K “Integral Solutions of the non- [18.] homogeneous biquadratic equation with four unknowns International journal of computational journal of computational Engineering Research,Vol-3(4),51-56,2013

Experimental Studies on Effect of Coil Wire Insert On Heat Transfer Enhancement and Friction Factor of Double Pipe Heat Exchanger

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ABSTRACT:
In the present study heat transfer characteristics and friction factor of horizontal double pipe heat exchanger with coil wire inserts made up of different materials are investigated. The Reynolds numbers are in the range of 4000-13000. The inner and outer diameters of tubes are 17 mm and 21.4 mm respectively. Hot water and cold water are used as working fluid on tube side and annulus side, respectively. The hot water and cold water flow rates are maintained same and in range of .033 to .1 kg/s. Three different materials as copper, aluminum, and stainless steel and different pitches are used. Aluminum, copper, and stainless steel inserts are of pitches 5, 10, and 15 mm respectively. Effect of these coil wire inserts material on enhancement of heat transfer and friction factor are considered. The experimental data obtained from plain tube were verified with the standard correlation to ensure the validation of experimental results. Coil wire has significant effect on heat transfer and friction factor. Cu insert has higher heat transfer enhancement of 1.58 times as compared to plane tube. On other hand Aluminum and stainless steel insert has heat transfer enhancement of 1.41 and 1.31as compared to plane tube respectively. The friction factor found to be increasing with decreasing coil wire pitch.

Keywords: coil wire, insert, enhancement, friction factor, heat exchanger

I. INTRODUCTION:

Heat transfer enhancement techniques are frequently used in a heat exchanger system in order to enhance heat transfer and increase in thermal performance of the system [6, 16]. Heat transfer enhancement techniques are divided in to two categories: active and passive methods. In active method, heat transfer is improved by supplying extra energy to the fluid or equipment. Active method include: use of mechanical auxiliary elements, rotating the surface, mixing fluid with mechanical accessories and constituting electrostatic in flow area. In contrast, the passive enhancement can be acquired without any external energy. The passive method include: the rough surfaces, extended surfaces, coated surfaces, and turbulator/ swirl generator devices. Coiled wire and twisted tape inserts are most commonly used swirl flow devices in order to enhance heat transfer in heat exchangers. These inserts causes redevelopment of boundary layer and increase in heat transfer surface area and cause enhancement of convective heat transfer by increasing turbulence.

To date, numerous researches have been carried out concerning the effect of coiled wire/ twisted tape inserts on heat transfer and friction factor. Effect of coil pitch, coil wire thickness for coil wire inserts and twist ratio and tape thickness for twisted tape inserts on heat transfer and friction factor are considered [1-11]. Effect of coil pitch and other corresponding parameters on heat transfer enhancement and friction factor of the horizontal concentric tubes with coiled wire inserts are proposed by Naphon[2] and it was found that coiled wire inserts are specially effective on laminar flow region in terms of heat transfer enhancement. Yakut and Sahin[12] experimentally investigated the heat transfer and pressure drop in a coiled wire inserted tube besides the properties of vortices generated by coiled wire insert and relation between entropy generation and vortex characteristics. A Garcia et al. [1] study effect of coil wire insert inside a horizontal tube in a laminar, transition and turbulent region with different pitch and wire diameter. At low Reynolds number coil wire found to be behaves as a smooth tube but accelerates critical Reynolds number down to 700. In turbulence region coil wire increase heat transfer rate up to four times compared to smooth tube. Y Shoji [5] study effect of length and segmentation of coil wire insert on heat transfer enhancement. It was found that increase with increase of coil wire length.

In heat transfer enhancement studies it was found that coil wire inserts provided much more heat transfer rate when they are used in combination with twisted tapes. S.Eiamsa-ard [4] used coiled wire and twisted tape inserts together. The obtained result revealed that dual combination of twisted tape and coiled wire provide higher heat transfer rate than that of single use of twisted tape and coiled wire. Sibel Gunes et al. [17] studies heat transfer enhancement in a tube with equilateral triangle cross-section wire inserts. Akhavan-Behabaddi et al. [8] studies pressure drop and heat transfer augmentation due to coiled wire inserts during laminar flow of oil inside a horizontal tube. Akhavan-Behabaddi et al [9] also concluded experimental work to determine heat transfer and pressure drop during flow boiling of R-134a in a coil wire inserted horizontal evaporator.

Till date, published paper in a archival journal include only effect of coil wire geometry as coil pitch, coil wire diameter on heat transfer enhancement and pressure drop. The effect of coil wire insert material has not been mentioned yet. The present paper is experimental investigation of effect of coil wire insert made up of three different materials as Aluminum, stainless steel, and copper with different pitches on heat transfer enhancement and friction factor of double pipe heat exchanger. Aluminum, stainless steel and copper coil wire inserts of pitches 5, 10, and 15mm respectively are used. The Reynolds number used in a range of 4000-13000. The effect of these inserts on Nusselt number and friction factor are investigated experimentally.

II. EXPERIMENTAL SETUP

Schematic diagram of experimental apparatus is as shown in figure (1). Experiments were conducted in a double pipe heat exchanger. The hot water flows through inner tube (M.S. tube of d_i=17 mm) and cold water flows in counter flow through annulus. To measure pressure drop across test section two pressure taps are provided at inlet and of test section. Two calibrated rotameters were provided to indicate flow rate of test liquid. Two 3 kW geysers were used for providing hot water. Cold water and hot water flow rate were maintained equal and in range of .033 to .1 kg/s. Three coil wire inserts made up of copper, aluminum, and stainless steel were used in inner tube of double pipe heat exchanger. Four thermocouples were provided to measure inlet and outlet temperature of hot and cold waters. The test section is horizontal double pipe heat exchanger. The inner and outer diameters of inner tube are 17 and 21.4 mm respectively and that of outer tube are 42 and 48 mm respectively. The dimensions of tube with coil wire insert is shown table --.

Table 1: Range/values of parameters.

Parameter	Range/values

The flow rates of water	2, 3,4,5,6 (Lit/min)		
ID of inner tube (di)	0.017 m	OD of inner tube (do)	0.0214 m
ID of outer tube (Di)	0.042 m		
Pitches of coil wire insert			
Copper insert	5 mm		
Aluminum inserts	10 mm		
Stainless steel insert	15 mm		
Test length of heat exchanger:			
For heat transfer	1.5m		
For pressure drop	1.6m		

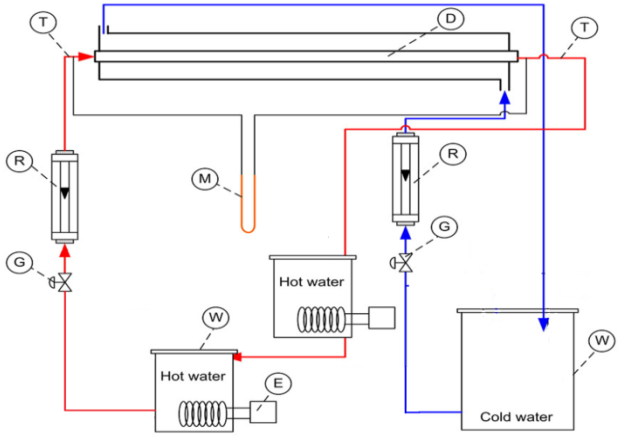

Fig. 1. Schematic diagram of the test apparatus: (B) Ball valve, , (D) Double pipe heat exchanger, (E) Ele ctrical heater,(M) Manometer, (G) Globe valve, (R) Rotameter, (T) RTD, and (W) Water tank.

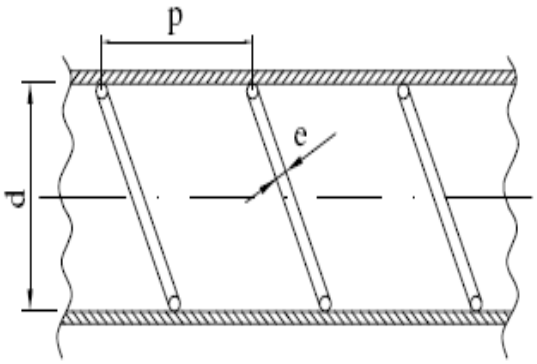

Fig. 2 Sketch of a coil wire fitted inside a smooth tube

III. DATA REDUCTION

The average Nusselt number and the friction factor are based on the inner diameter of the test tube. Heat absorbed by the cold water in the annulus, Qw,c can be written by

$$Q_{w,c} = m_c\, Cp,_w\, (T_{c,\,out} \_ T_{c,\,in}) \quad (1)$$

where m_c is the mass flow rate of cold water; Cp,w is the specific heat of water; Tc,in and Tc,out are the inlet and outlet cold water temperatures, respectively. The heat supplied from the hot water, Qh can be determined by

$$Q_h = m_h\, Cp,_h\, (T_{h,\,out} - T_{h,\,in}) \quad (2)$$

where m_h is the hot water mass flow rate; $T_{h,\,in}$ and $T_{h,\,out}$ are the inlet and outlet hot water temperatures, respectively.

The heat supplied by the hot fluid into the test tube is found to be 3% to 8% different than the heat absorbed by the cold fluid for thermal equilibrium due to convection and radiation heat losses from the test section to surroundings. Thus, the average value of heat transfer rate, supplied and absorbed by both fluids, is taken for internal convective heat transfer coefficient calculation.

$$Qavg = (Q_c+Q_h)/2 \quad (3)$$

For fluid flows in a concentric tube heat exchanger, the heat transfer coefficient, h_i is calculated from

$$Q_{ave} = U_i\, A_i\, \Delta T_{LMTD} \quad (4)$$

Where

$$Ai = \pi\, d_i\, L$$

The tube-side heat transfer coefficient hi is then determined using

$$\frac{1}{Ui} = \frac{1}{hi} + d_i \ln\frac{do}{di} + \frac{di}{do}\frac{1}{ho} \quad (5)$$

When the last three tirm on right side of equation (5) are kept constant and set to C_1 then equation (5) can be written as

$$\frac{1}{Ui} = \frac{1}{hi} + C_1 \quad (6)$$

Then heat transfer coefficient is related to Reynolds as

$$h_i = C\, Re^{\,m} \quad (7)$$

Where C and m stands for constant and power index values substituting equation (7) in equation (6)

$$\frac{1}{Ui} = \frac{1}{C} Re^{-m} + C1 = a\ Re^{-m} + C_1 \quad (8)$$

Eq. 8 implies that plot between $\frac{1}{Ui}$ and Re^{-m} is a straight line with its slope of a and intercept at C_1 in Y- axis ($\frac{1}{Ui}$). Rearranging equation (8) yields

$$h_i = \frac{1}{(\frac{1}{Ui} - 1)} \quad (9)$$

Then Nusselt number is calculated as

$$Nu = \frac{hi\ di}{k} \quad (10)$$

Friction factor f is calculated as

$$f = \frac{\Delta p}{L/_D \rho U^2/_2} \quad (11)$$

IV. RESULT AND DISCUSSION

4.1 Verification of Experimental Result

First of all, the result obtained from experiment on heat transfer and friction factor characteristics in plane tube are verified in terms of Nusselt number, and friction factor. The Nusselt number and friction factor obtained from present plain tube compared with those from the proposed correlation by Gnienlinski for Nusselt number and proposed correlation by Blausius for friction factor.

$$Nu = 0.012(Re^{.87} - 280)\ Pr^{.4} \quad (12)$$

$$f = .316\ Re^{-.25} \quad (13)$$

Fig.3and 4 shows comparison of Nu number and friction factor of plain tube obtained from present study with those from proposed correlation. The data obtained from the experiments for the plain tube are reasonable agreement with predicted result from proposed correlation with discrepancy of ± 20% and ± 5% for Nusselt number and friction factor respectively.

4.2 Effect of coil wire insert on heat transfer enhancement

Fig.5 shows variation of Nusselt number with Reynolds number for tube fitted with coil wire inserts of different materials (copper, aluminum, and stainless steel). From fig.(5) it can be seen that Nusselt number for the tube fitted with coil wire insert are higher than that of plain tube for given Reynolds number. This is because coil wire insert interrupts the development of boundary layer of the fluid flow near the wall of test section hence it increases fluid temperature in the radial direction. Due to larger contact surface area the heat transfer rate increases. Also it creates the turbulence and whirling motion to the water when is flowing inside the test section. The whirling makes flow to be highly turbulent, which leads to improved convection heat transfer.

As a Reynolds number increases for a given coil wire inserts, the Nusselt number also increases indicating enhanced heat transfer. It is also observed from fig. (5) that Nusselt number for a given Reynolds number is higher for copper insert than aluminum and stainless steel inserts. Cu tube causes higher heat transfer enhancement about 1.58, and aluminum and stainless steel causes heat transfer rate enhancement up to 1.41 and 1.31 respectively.

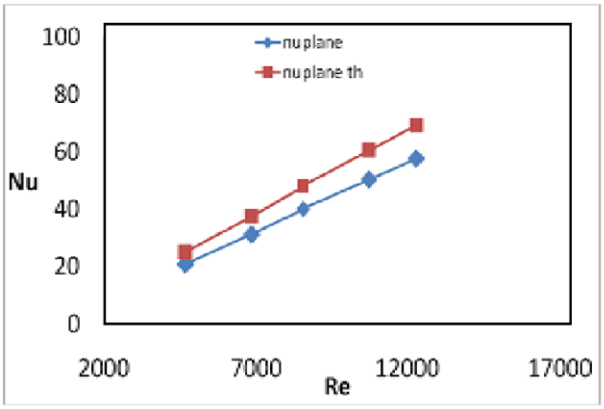

Fig. 3 Comparison of Nusselt number–plain tube.

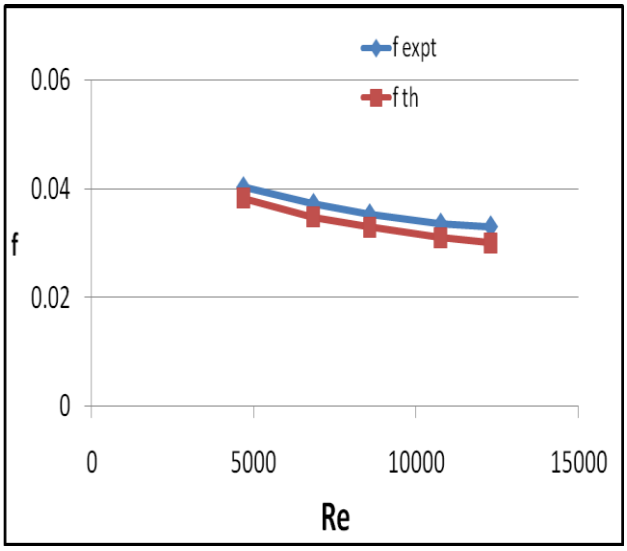

Fig. 4 Comparison of friction factor - plain tube

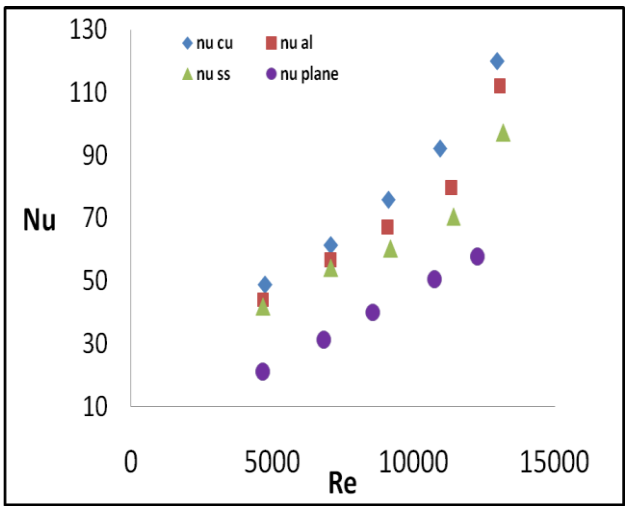

Fig. 5 Comparison of Nusselt number Vs Reynolds number with various coil wire inserts

4.3 Effect of coil wire insert on overall heat transfer coefficient

Fig.(6) shows variation of overall heat transfer coefficient (Ui) with Reynolds number. It can seen that Ui increases with Reynolds number for all cases. Overall heat transfer coefficient is higher for copper coil wire insert than aluminum, stainless steel inserts and plain tube.

4.4 Effect of coil wire insert on friction factor Generally the friction factor decreases with the increasing Reynolds Number for different pitches. From fig. 7 it can be seen that friction factor for the tube fitted with coil wire inserts are significantly higher than plane tube for a given Reynolds. It indicates that friction factor for a given Reynolds number increases with decreasing pitch due to swirl flow generated by coil wire inserts and reaches a maximum for pitch of 5 mm. From fig it can be seen that friction factor of Stainless steel insert of 10 mm pitch is less when compared with turbulator of aluminum pitch of 5mm. This is due to less contact surface of turbulator, so more area is available for water to flow in the test section. The friction factor of aluminum coil wire insert of 5 mm pitch is 5.4 to 6.7 times of the plane tube. Stainless steel tube insert cause friction factor of 4.8 to 5.9 times to plane tube and copper insert has friction factor of 4.3 to 5.4 times plane tube.

4.5 Effect of coil wire insert on heat transfer ratio The heat transfer ratio (Nu_a/Nu_o) is ratio of Nusselt number obtained from tube with coil wire insert to that of plane tube. The heat transfer ratio is shown in fig.(8). It is clear that for a net energy gain, that is, for an effective heat transfer, the heat transfer ratio must be greater than unity. It can be seen that from fig. (8) heat transfer increase introduced by coiled wire insert is remarkable. The Nusselt number ratio value tends to decrease with the increase of Reynolds number from 4000 to 12000 for all cases. The heat transfer ratio is higher for copper than aluminum and stainless steel coil inserts irrespective of higher pitch. The copper coil wire insert has (Nu_a/Nu_o) ratio of 1.53 to 1.68, aluminum has 1.35 to 1.53 and stainless steel has 1.2 to 1.46.

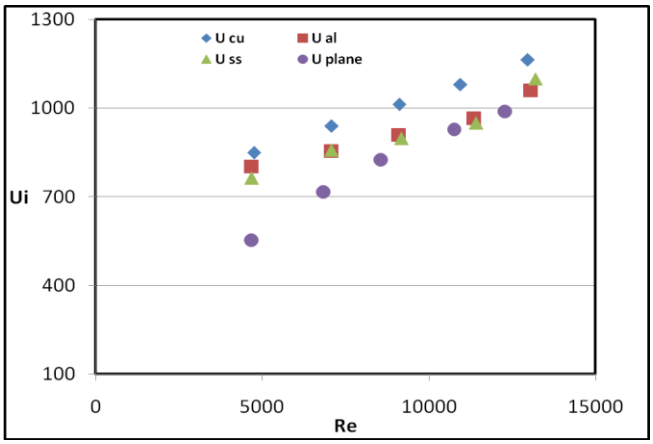

Fig. 6 Comparison of Overall heat transfer coefficient Vs Reynolds number with various coil inserts

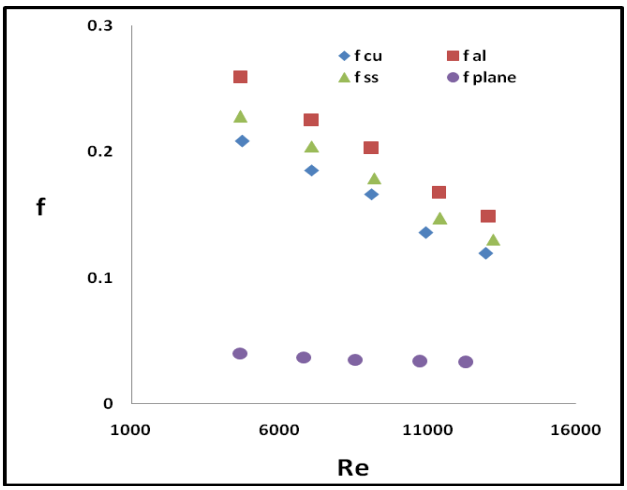

Fig. 7 Comparison of friction factor Vs Reynolds number with various coil wire inserts

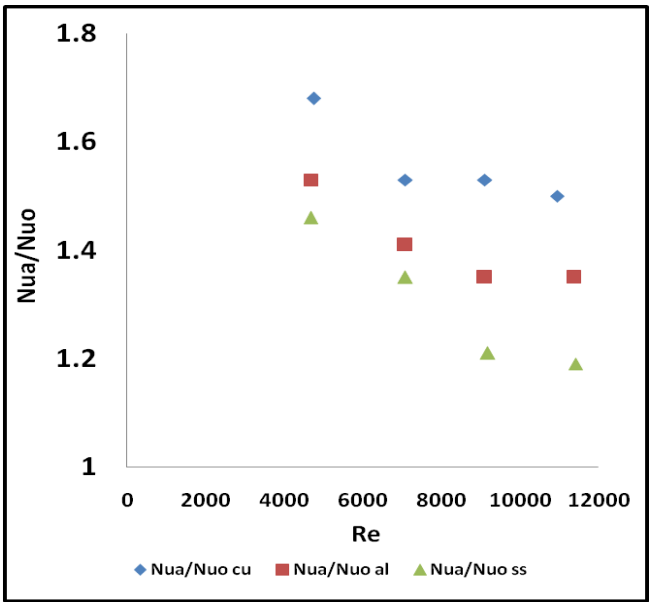

Fig. 8 Comparison of Nu_a/Nu_o Vs Reynolds number with various coil wire inserts

V. CONCLUSIONS.

Experimental investigation of the heat transfer an**d** friction factor characteristics of a double pipe heat exchanger fitted with coil wire insert made up of three different material as copper, aluminum and stainless steel and different pitches have been studied for Reynolds number in range of 4000-13000 and following conclusion are drawn.

1. Experimental data obtained for plane tube were compared with those from theoretical correlations. The data obtained is in good agreement with the theoretical correlation with the discrepancy of ±20% for Nusselt number and ±05% for friction factor.
2. The maximum Nusselt number is obtained for copper coil wire insert than aluminum and stainless steel coil wire insert .The copper, aluminum, and stainless steel coil wire insert cause heat transfer enhancement up to 1.58, 1.41, and 1.31 respectively as compared to plane tube.
3. Friction factor found to be increasing with the decreasing pitch of coil wire insert. It is higher for aluminum insert of 5 mm pitch than stainless steel and copper coil wire insert of 10 and 15 mm pitch respectively.
4. The above finding indicates that copper can be used as coil wire insert material for higher heat transfer enhancement than aluminum and stainless steel.
5. The above finding also indicates that coil wire insert in double pipe heat exchanger enhances heat transfer with considerable pressure drop.

Nomenclature.

A	Area
d	Tube diameter, m
L	Length of test section, m
h	Heat transfer coefficient, kW/(m^2 °C)
k	Thermal conductivity, kW/(m °C)
Nu	Nusselt number
Q	Heat transfer rate, kW
T	Temperature, °C
C_p	Specific heat, kJ/(kg °C)
f	Friction factor
p	Coil pitch, m
m	Mass flow rate, kg/s
Pr	Prandtl number
Re	Reynolds number
V	Velocity, m/s

Subscripts

ave	Average
h	Hot
in	Inlet
out	Outlet
w	Water
c	Coil
i	Inside
o	Outside

REFERENCES

[1] A.García, P.G. Vicente, A. Viedma, Experimental study of heat transfer enhancement with wire coil inserts in laminar-transition-turbulent regimes at different Prandtl numbers, Int. J. Heat Mass Transfer 48 (2005) 4640–4651.

[2] Paisarn Naphon, Effect of coil-wire insert on heat transfer enhancement and pressure drop of the horizontal concentric tubes, International Communications in Heat and Mass Transfer 33 (2006) 753–763

[3] Heat transfer and pressure drop in a spirally grooved tube with twisted tape insert
P. Bharadwaj, A.D. Khondge, A.W. Date International Journal of Heat and Mass Transfer 52 (2009) 1938–1944

[4] S. Eiamsa-ard, P. Nivesrangsan, S. Chokphoemphun, P. Promvonge, Influence of combined non-uniform wire coil and twisted tape inserts on thermal performance characteristics, International Communications in Heat and Mass Transfer 37 (2010) 850–856

[5] Y. Shoji, K. Sato, D.R. Oliver, Heat transfer enhancement in round tube using wire coil: influence of length and segmentation, Heat Transfer – Asian Res. 32 (2003) 99–107.

[6] L. Wang, B. Sunden, Performance comparison of some tube inserts, Int. Commun. Heat Mass Transfer 29 (1) (2002) 45–56.

[7] P. Promvonge, Thermal augmentation in circular tube with twisted tape and wire coil turbulators, Energy Convers. Manage. 49 (2008) 2949–2955.

[8] M.A. Akhavan-Behabadi, M.R. Salimpour, V.A. Pazouki, Pressure drop increase of forced convective condensation inside horizontal coiled wire inserted tube, Int. Commun. Heat Mass Transfer 35 (2008) 1220–1226.

[9] M.A. Akhavan-Behabadi, S.G. Mohseni, H. Najafi, H. Ramazanzadeh, Heat transfer and pressure drop characteristics of forced convective evaporation in horizontal tubes with coiled wire insert, Int. Commun. Heat Mass Transfer 36 (9) (2009) 1089–1095.

[10] K.N. Agrawal, M.A. Anil Kumar, A. Behabadi, H.K. Varma, Heat transfer augmentation by coiled wire inserts during forced convection condensation of R-22 inside horizontal tubes, Int. J. Multiphase Flow 24 (1998) 635–650.

[11] P. Naphon, P. Sriromruln, Single-phase heat transfer and pressure drop in the micro-fin tubes with coiled wire insert, Int. Commun. Heat Mass Transfer 33 (2006) 176–183.

[12] K. Yakut, B. Sahin, The effects of vortex characteristics on performance of coiled wire turbulators used for heat transfer augmentation, Appl. Therm. Eng. 24 (16) (2004) 2427–2438. [14] P. Naphon, Effect of coil-wire insert on heat transfer enhancement and pressure drop of the horizontal concentric tubes, Int. Commun. Heat Mass Transfer 33 (6) (2006) 753–763. [15] P. Promvonge, Thermal performance in circular tube fitted with coiled square wires, Energy Convers. Manage. 49 (2008) 980–987.

[13] P. Promvonge, Thermal enhancement in a round tube with snail entry and coiled-wire inserts, Int. Commun. Heat Mass Transfer 35 (2008) 623–629.

[14] V. Ozceyhan, S. Gunes, O. Buyukalaca, N. Altuntop, Heat transfer enhancement in a tube using circular cross sectional rings separated from wall, Appl. Energy 85 (10) (2008) 988–1001.

[15] V. Ozceyhan, Experimental Investigation of Flow and Heat Transfer in a Rib Inserted Pipe, Erciyes University, Graduate School of Natural and Applied Sciences, Ph.D. Thesis, Turkey, 2002.

[16] A. Dewan, P. Mahanta, S.K. Raju, S.K. Kumar, Review of passive heat transfer augmentation techniques, Journal Power Energy 218 (2004) 509–525.

[17] S. Gunes, V. Ozceyhan, O. Buyukalaca, Heat transfer enhancement in a tube with equilateral triangle cross sectioned coiled wire inserts, Experimental Thermal and Fluid Science 36 (6) (2010) 684–691.

[18] P. Promvonge, Thermal augmentation in circular tube with twisted tape and wire coil turbulators, Energy Conversion and Management 49 (2008) 2949–2955.

[19] F. Incropera, P.D. Dewitt, Introduction to Heat Transfer, 3rd editionJohn Wiley & Sons Inc, 1996.

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Simulation studies on Deep Drawing Process for the Evaluation of Stresses and Strains

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ABSTRACT:
Deep drawing is a sheet metal forming process in which a sheet metal blank is radially drawn into a forming die by the mechanical action of a punch. It is thus a shape transformation process with material retention. The process is considered "deep" drawing as the depth of the drawn part exceeds its diameter. The flange region (sheet metal in the die shoulder area) experiences a radial drawing stress and a tangential compressive stress due to the material retention property. These compressive stresses (hoop stresses) result in flange wrinkles. Wrinkles can be prevented by using a blank holder, the function of which is to facilitate controlled material flow into the die radius. The present study therefore aims at estimating the pattern of radial and hoop stress and strain distributions and their variation under different blank holding forces (BHF) and friction forces. In the paper , comparison between the stress and strain distribution with steel and copper materials also made by changing the blank holding force (BHF) and the friction force (FF) between the punch and the blank during the deep drawing process. The investigation of effect of friction and blank holding force is performed using the numerical software tool ABAQUS. ABAQUS software is used to model the deep drawing process to evaluate stresses under BHF and FF.

Key Words: *Deep drawing, BHF, FF, Hoop stress, Radial stress, wrinkle, Necking.*

I. INTRODUCTION

Drawing [1] is a sheet metal forming operation used to make cup-shaped, box-shaped, or other complex-curved, hollow-shaped parts. It is performed by placing a piece of sheet metal over a die cavity and then pushing the sheet into the opening with a punch. The blank is held down flat against the die by a blank holder. The component developed in this process is subjected to the following state of stress☹i) Compression in the circumferential direction (the outer perimeter becomes smaller) (ii) Tension in the radial direction (iii)A relatively small compression in the thickness direction (iv)Since the volume of metal remains constant, and because the circumferential stress is relatively large, the sheet will thicken as it moves in the flange area. (This is why the clearance between the punch and die is higher than the sheet thickness by about 10%).The success of a drawing operation depends upon the several factors including:

The formability of the material being drawn, Limiting the drawing punch force to a lower value than that which will fracture the shell wall, Adjustment of the blank holder force to prevent wrinkles without excessively retarding metal flow, and Selecting materials for both die and blank to have sufficient coefficient of friction. Many literatures tried to model the process in order to study the influence the above mentioned parameters. In this paper, the process is modeled with ABAQUS software and studied the influence of BHF(Blank Holding Force) and coefficient of friction(FF) on the stresses and strains developed in the deep drawed components. The induced strains and stresses are the main responsible to reduce the defects such as wrinkling, tearing and necking. The paper is organized in the following manner:

Literature on modeling of deep drawing process is given in section two. The simulation modeling and the results obtained through the developed models are described in section three and four respectively. Section five drws the conclusions.

II. LITERATURE REVIEW

In 2005, Dr. Waleed Khalid Jawad [4] solved finite element program code (ANSYS 5.4), is used to perform the numerical simulation of the deep drawing operation. A simplified axisymmetric model of cylindrical cup has been developed, and the numerical results are compared with the experimental work.In 2007, A. Wifi* A. Mosallam [5] presented a finite element-based assessment of the performance of some non-conventional blank-holding techniques. This includes friction actuted, pulsating, and pliable blank-holding techniques. Ben Ayed, A. Delamézière, J.L. Batoz, C. Knopf-Lenoir] [6] optimized both a constant and a time dependent blank holder force. In this paper ,the numerical simulations are performed using ABAQUS Explicit. The optimization is based on a response surface method.

III. FINITE ELEMENT MODELING

Abaqus/Standard used for the analysis of friction conditions at the deep drawing of a cylindrical cup. Deep drawing of sheet metal is an important manufacturing technique. In the deep drawing process a "blank" of sheet metal is clamped by a blank holder against a die. A punch is then moved against the blank, which is drawn into the die. Unlike the operation described in the hemispherical punch stretching example, the blank is not assumed to be fixed between the die and the blank holder; rather, the blank is drawn from between these two tools. The ratio of drawing versus stretching is controlled by the force on the blank holder and the friction conditions at the interface between the blank and the blank holder and the die. Higher force or friction at the blank/die/blank holder interface limits the slip at the interface and increases the radial stretching of the blank. In certain cases draw beads, shown in, are used to restrain the slip at this interface even further. During the drawing process the response is determined primarily by the membrane behavior of the sheet. For axisymmetric problems in particular, the bending stiffness of the metal yields only a small correction to the pure membrane solution. In contrast, the interaction between the die, the blank, and the blank holder is critical. Thus, thickness changes in the sheet material must be modeled accurately in a finite element simulation, since they will have a significant influence on the contact and friction stresses at the interface. In these circumstances the most suitable elements in Abaqus are the 4-node reduced-integration axisymmetric quadrilateral, CAX4R; the first-order axisymmetric shell element, SAX1; the first-order axisymmetric membrane element, MAX1; the first-order finite-strain quadrilateral shell element, S4R; the fully integrated general-purpose finite-membrane-strain shell element, S4; and the 8-node continuum shell element, SC8R. Membrane effects and thickness changes are modeled properly with CAX4R. However, the bending stiffness of the element is low. The element does not exhibit "locking" due to incompressibility or parasitic shear. It is also very cost-effective. For shells and membranes the thickness change is calculated from the assumption of incompressible deformation of the material.

3.1 Deep Drawing Geometry Details:

From Fig.3.1, the following description can be made: The circular blank being drawn has an initial radius of 100 mm and an initial thickness of 0.82 mm. The punch has a radius of 50 mm and height from is 60mm. The die has an internal radius of 51.25 mm and is rounded off at the corner with a radius of 5 mm. The blank holder has an internal radius of 49 mm.

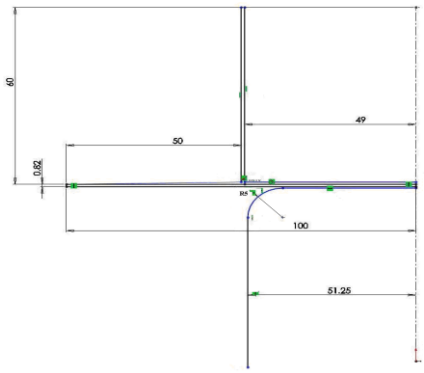

Fig. 3.1: Geometry deep drawing

3.2 Simulation Model:

The developed simulation model is shown in Figure 3.2.The blank is modeled using 40 elements of type CAX4R or 31 elements of type SAX1, MAX1, models. These meshes are rather coarse for this analysis. However, since the primary interest in this problem is to study the membrane effects, the analysis will still give a fair indication of the stresses and strains occurring in the process.The contact between the blank and the rigid punch, the rigid die, and the rigid blank holder is modeled with the contact pair option. The top and bottom surfaces of the blank are defined by means of the surface option. The rigid punch, the die, and the blank holder are modeled as analytical rigid surfaces with the Rigid body option in conjunction with the surface option. The mechanical interaction between the contact surfaces is assumed to be frictional contact. Therefore, the Friction option is used in conjunction with the various *surface interaction property options to specify coefficients of friction.

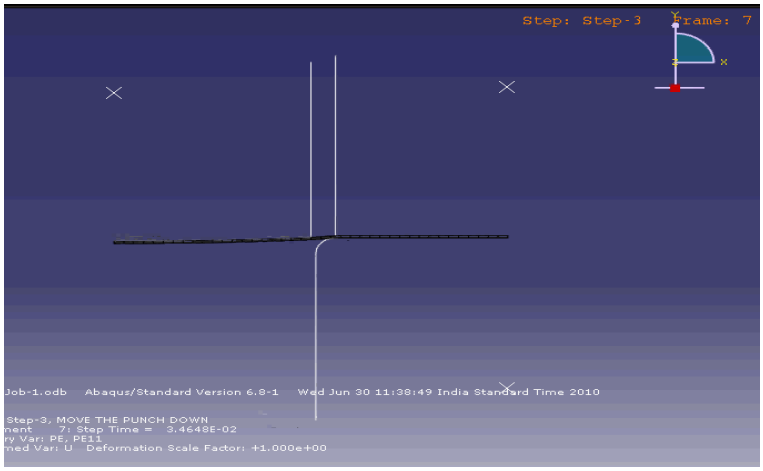

Fig 3.3 Simulation Model

IV. RESULTS AND DISCUSSIONS

Deforming shape in the drawing process for the CAX4R model is shown in fig 4.1. The profiles show that the metal initially bends and stretches and is then drawn in over the surface of the die. The distributions of radial strain, circumferential strain and thickness strain for the CAX4R model are shown. The thickness does not change very much, the change is very small. Relatively small thickness changes are usually desired in deep drawing processes and are achieved because the radial tensile strain and the circumferential compressive strain balance each other. The deformed shape after complete unloading is superimposed on the deformed shape under complete loading. The analysis shows the lip of the cup springing back strongly after the blank holder is removed for the CAX4R model. This springback in the CAX4R model is not physically realistic: in the first-order reduced-integration elements, an elastic "hourglass control" stiffness is associated with the "bending" mode, since this mode is identical to the "hourglass" mode exhibited by this element in continuum situations. In reality the bending of the element is an elastic-plastic process, so that the springback is likely to be much less.The deformed shape after complete unloading is superimposed on the deformed shape under complete loading. The analysis shows the lip of the cup springing back strongly after the blank holder is removed for the CAX4R model. No springback is evident in the shell models. As was noted before, this springback in the CAX4R model is not physically realistic: in the first-order reduced-integration elements an elastic "hourglass control" stiffness is associated with the "bending" mode, since this mode is identical to the "hourglass" mode exhibited by this element in continuum situations. In reality the bending of the element is an elastic-plastic process, so that the springback is likely to be much less. A better simulation of this aspect would be achieved by using several elements through the thickness of the blank, which would also increase the cost of the analysis. The springback results for the shell models do not exhibit this problem and are clearly more representative of the actual elastic-plastic process.

***4.1 Simulated Diagrams with the variation BHF and friction*:** The simulated diagrams under two sets of BHF and friction given in the figures from 4.1 to 4.9.

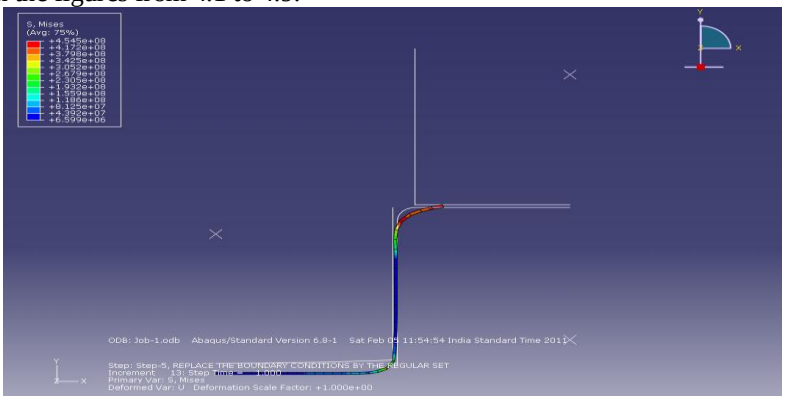

Fig 4.1 Von-Mises stress distribution when (B H F=10 kN, μ=0.1)

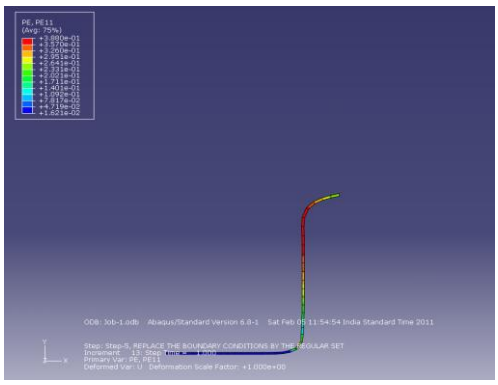

Fig 4.2 Radial Strain

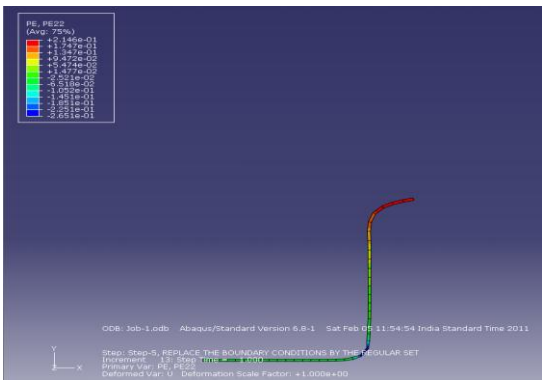

Fig 4.3 Longitudinal strain

4.2 The influence Blank Holding Force: From the Fig 4.10.it is observed that in case of steel Radial Strain increase from 0.3871to 0.489 as the Blank Holding Force is varying from 10 to 130kN. In case of copper the Radial Strain was Increasing from 0.404 to 0.454, when the Blank Holding Force is varying from 10 to 90kN.It is interesting to note that the rise in Radial Strain within the given range of Blank Holding Force is rapid when compare to steel. From the Fig 4.11. In case of steel Thickness Strain is observed to reduce from 0.2332 to 0.1932 and in case of copper it is reducing from 0.1972 to 0.1460 to the Blank Holding Force increasing from 10to 130kN in case of steel, and 10 to 90 in case of copper. It is

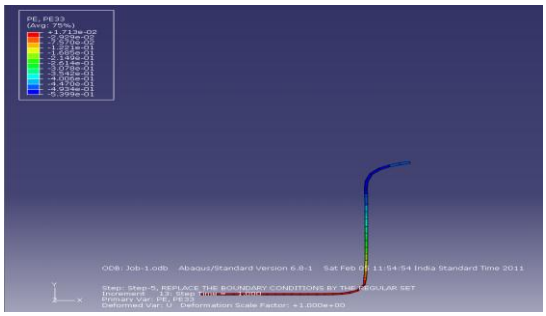

Fig 4.4 Hoop strain

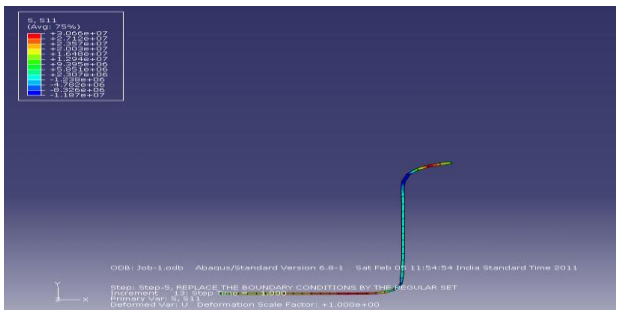

Fig 4.5 Radial Stress

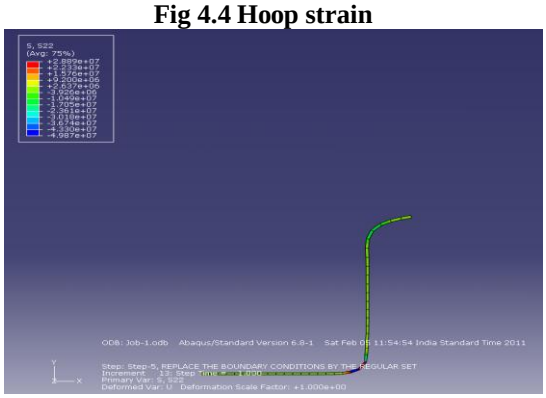

Fig 4.6 Longitudinal Stress

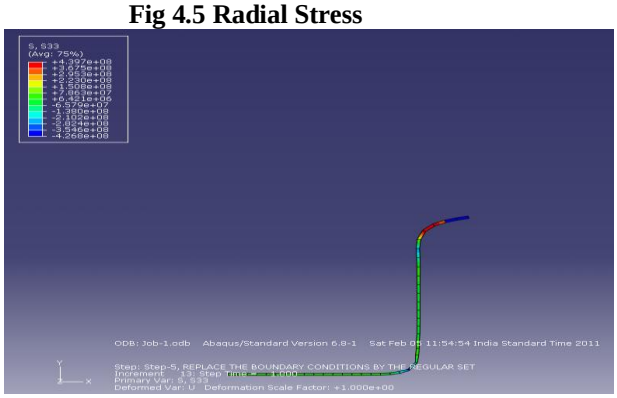

Fig 4.7 Hoop Stress

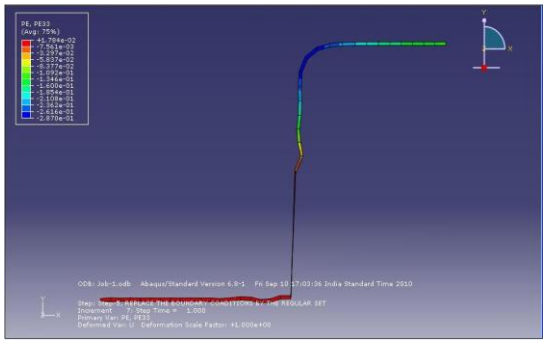

Fig 4.8 Failures in copper Radial Strain

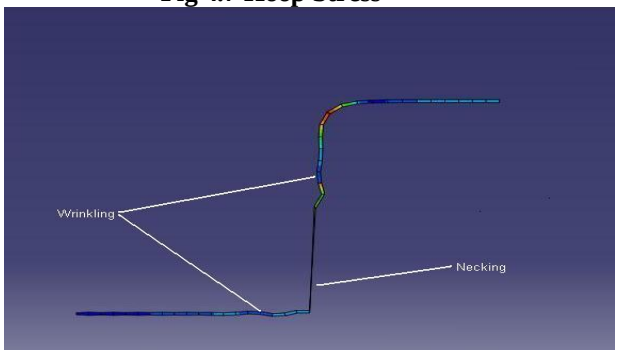

Fig 4.9 Failure of a steel Cylindrical Cup (BHF=130 kN, μ=0.1)

interesting to note that the fall in thickness strain in case of copper is more rapid when compare to steel. From the Fig 4.12.In case of steel Hoop strain is increasing from .0018 to .0036 as the blank holding force is increased from 10kn to 130 kN. From the Fig 4.13.In case of copper Hoop strain is decreasing from 0.0197 to 0.0191 as the blank holding force is increased from 10kn to 130 kN.

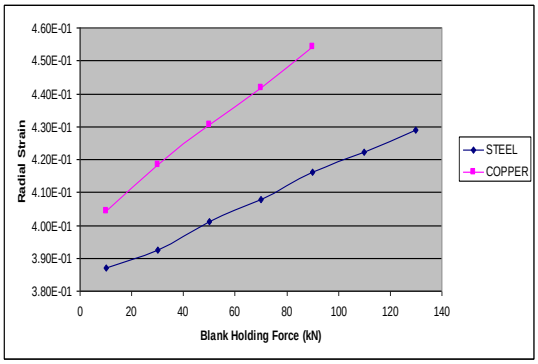

Fig 4.10 Radial strain Vs Blank Holding Force

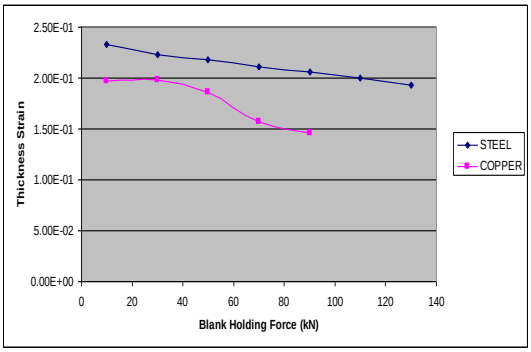

Fig 4.11 Longitudinal Strain Vs Blank Holding Force

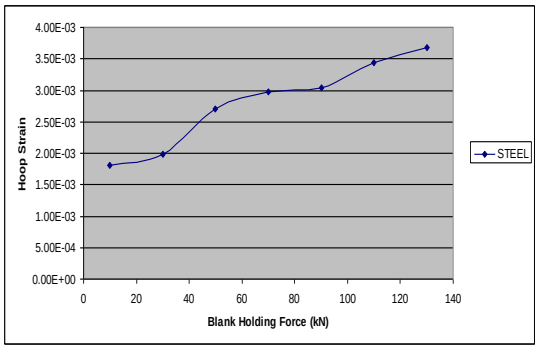

Fig 4.12 Hoop Strain Vs Blank Holding Force

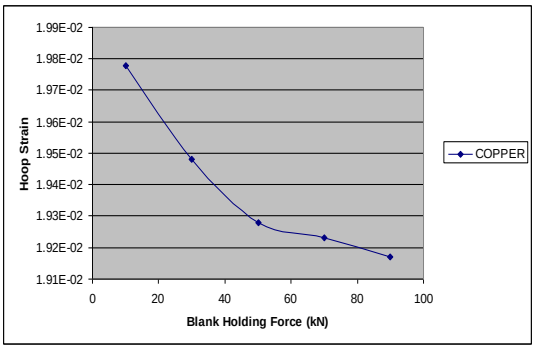

Fig 4.13 Hoop Strain Vs Blank Holding Force

From the Fig 4.14.In case of steel von mises stress is decreasing from 4.598E2 to 4.575E2 as the blank holding force is increased from 10kN to 130 kN. The decrease in von mises stress decreases the failure of cylindrical cup which is the major requirement in the cup forming process. From the Fig 4.15.In case of copper von mises stress is decreasing from 3.421E2 to 3.212E2 as the blank holding force is increased from 10kN to 130 kN.It can be seen that the fall in von mises stress is more in copper compared to steel.

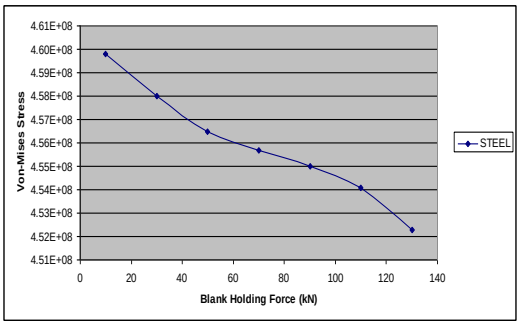

Fig 4.14 Von-Mises stress Vs Blank Holding Force

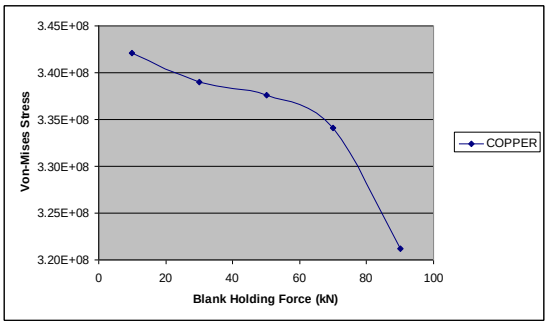

Fig 4.15 Von-Mises stress Vs Blank Holding Force

From the Fig 4.16.In case of steel Radial Stress is observed to increase from 28.38Mpa to 31.28Mpa as the Blank Holding Force is varying from 10 to 130kN.In case of copper the Radial Stress was Increasing from 18.26 to 25.08Mpa, when the Blank Holding Force is varying from 10 to 90kN.It is interesting to note that the rise in Radial Stress within the given range of Blank Holding Force is rapid when compare to steel.From the Fig 4.17.In case of steel Thickness Stress is observed to increase from 15.26 to 21.08Mpa and in case of copper it is increasing from 22.84 to 29.23Mpa as the Blank Holding Force increasing from 10 to 130kN in case of steel, and 10 to 90kN in case of copper. It is interesting to note that the rise in thickness stress in case of copper is more rapid when compare to steel. From the Fig 4.18. In case of steel hoop stress is observed to increase from 4.41E2 to 4.62E2 as the Blank Holding Force is varying from 10 to 130kN.From the Fig 4.19. In case of copper the hoop stress was increasing from 3.1E2 to 3.32E2, when the Blank Holding Force is varying from 10 to 90kN.

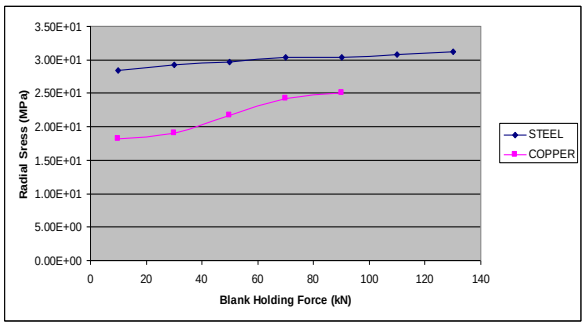

Fig 4.17 Thickness Stress Vs Blank Holding Force

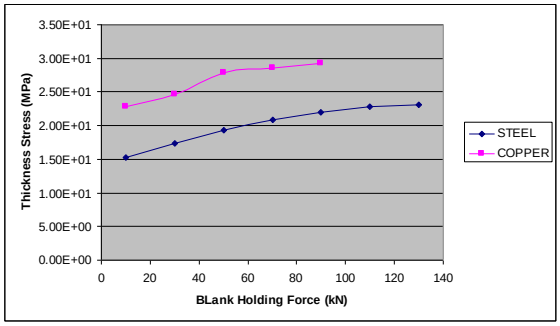

Fig 4.16 Radial Stress Vs Blank Holding Force

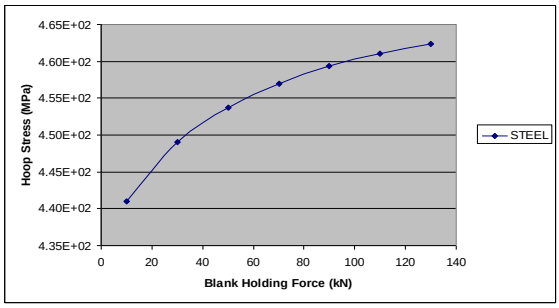

Fig 4.19 Hoop Stress Vs Blank Holding Force

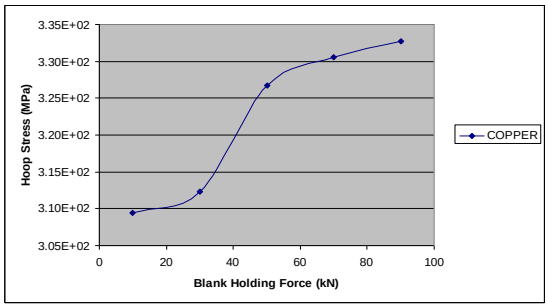

Fig 4.18 Hoop Stress Vs Blank Holding Force

4.3 The influence of Coefficient of friction:

From the Fig 4.20.In case of steel Radial Strain is observed to increase from 0.378 to 0.389 as the coefficient of friction is varying from 0.1 to 0.45.From the Fig 4.21.In case of copper as the coefficient of friction is varied from 0.1 to 0.45, the radial strain is decreasing gradually from 0.404 to 0.401.From the Fig 4.22.As the coefficient of friction is varied from 0.1 to 0.45 in case of steel the thickness strain is increasing from 0.2146 to 0.239. From the Fig 4.23.As the coefficient of friction is varied from 0.1 to 0.45 in case of copper the thickness strain is increasing from 0.1954 to 0.1993. From the Fig 4.24.In case of steel as the coefficient of friction is varied from 0.1 to 0.45 hoop strain is decreasing from 0.01713 to 0.1273 and where as in copper it is decreasing from 0.0233 to 0.0179.

From the Fig 4.25.As the coefficient of friction is varied from 0.1 to 0.45 von mises stress is increasing from 4.545E2 to 4.666E2 in case of steel.

From the Fig 4.26In case of copper also as the coefficient of friction is varied from 0.1 to 0.45 von-mises stress is increasing from 3.423E2 to 3.452E2.From the Fig 4.27.As the coefficient of friction is varied from 0.1 to 0.45 radial stress is increasing from 28.29 to 30.66 Mpa in case of steel.From the Fig 4.28.In case of copper as the coefficient of friction is varied from 0.1 to 0.45 radial stress is decreasing from 22.47 to 22.25 Mpa. It is interesting to note that radial stress is increasing in steel and in copper radial stress is decreasing as the coefficient of friction is varied from 0.1 to 0.45.From the Fig 4.29.The thickness stress is increasing from 15.26 to 34.99Mpa in case of steel as the friction is increased whereas in copper thickness stress remains constant from friction value of 0.1 to 0.2 and after 0.2 thickness stress is increasing.From the Fig 4.30.Hoop stress is increasing from 4.39E2 to 4.522E2 Mpa as the coefficient of friction is varied from 0.1 to 0.45 in case of steel.From the Fig 4.31.whereas in case of copper Hoop stress is increasing from 4.39E2 to 4.522E2 Mpa as the coefficient of friction is varied from 0.1 to 0.45.

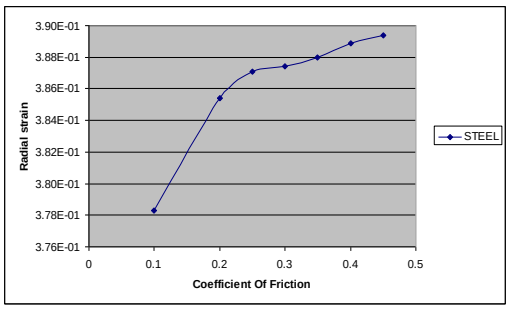

Fig 4.21 Radial Strain Vs Coefficient of Friction

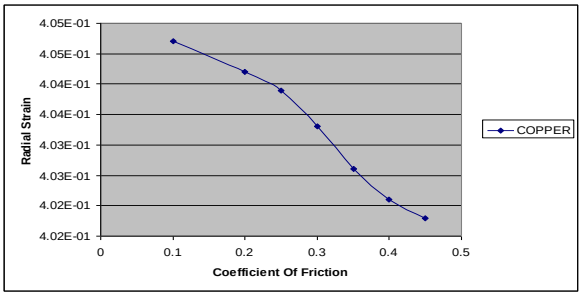

Fig 4.20 Radial Strain Vs Coefficient of Friction

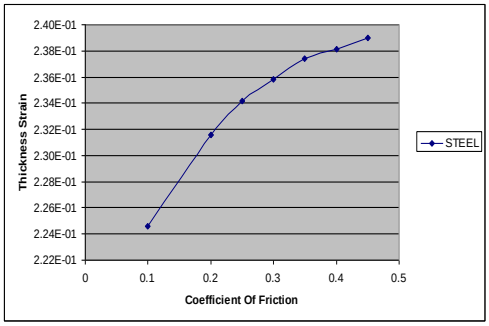

Fig 4.23 Thickness Strain Vs Coefficient of Friction

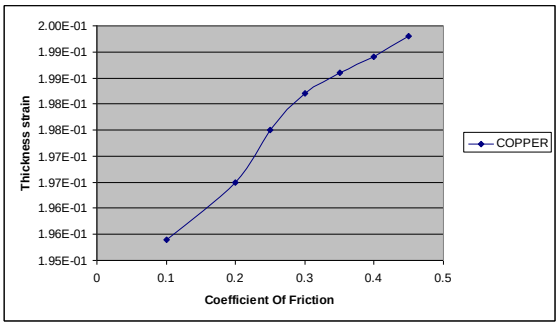

Fig 4.22 Thickness Strain Vs Coefficient of Friction

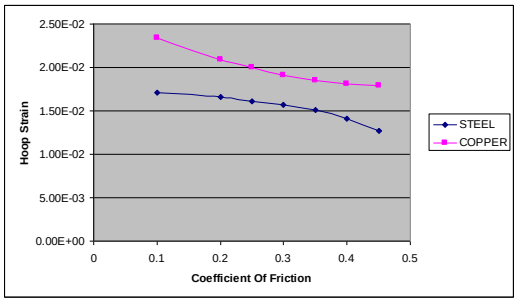

Fig 4.25 Von-Mises Stress Vs Coefficient of Friction

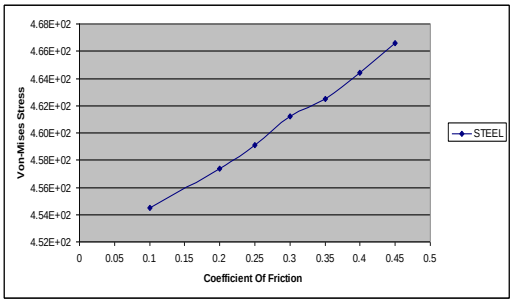

Fig 4.24 Hoop Strain Vs Coefficient of Friction

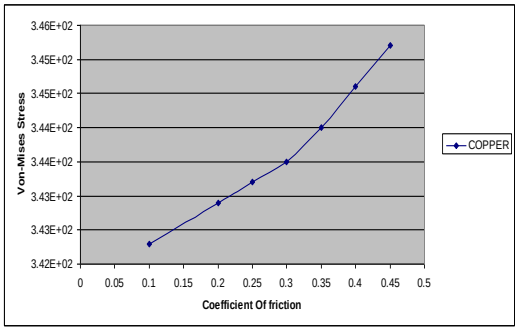

Fig 4.26 Von-Mises Stress Vs Coefficient of Friction

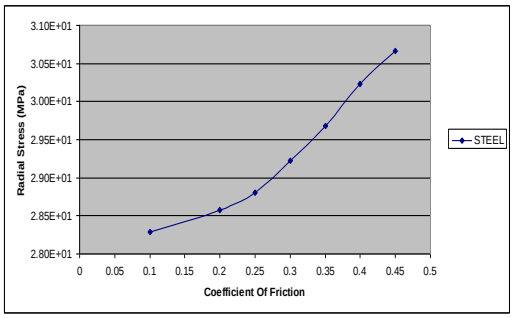

Fig 4.27 Radial Stress Vs Coefficient of Friction

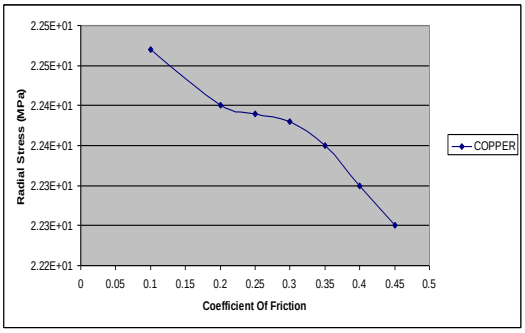

Fig 4.28 Radial Stress Vs Coefficient of Friction

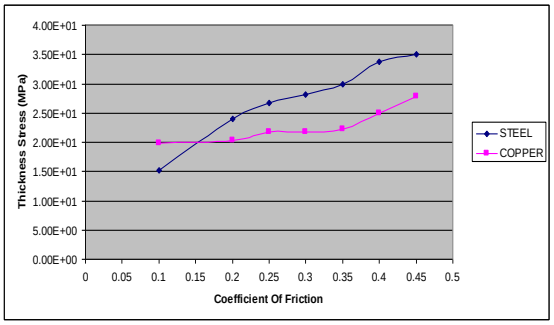

Fig 4.29 Thickness Stress Vs Coefficient of Friction

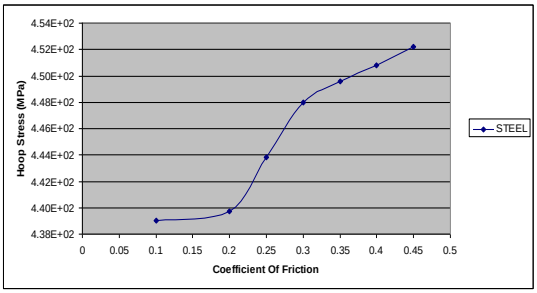

Fig 4.30 Hoop Stress Vs Coefficient of Friction

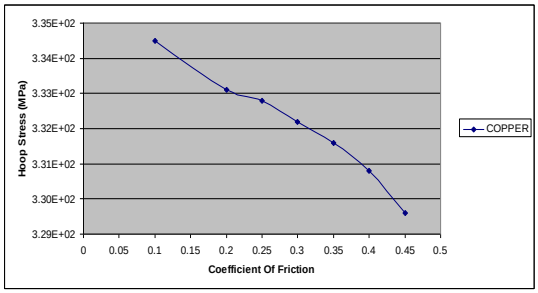

Fig 4.31 Hoop Stress Vs Coefficient of Friction

V. CONCLUSIONS

In this simulation , an attempt is made to understand the effect of BHF and the friction between punch and the blank on the formation of a deep drawing of cylindrical cup.The following conclusions are made from the simulation studies:

- A finite element procedure using ABAQUS is established to simulate the deep drawing process. This includes the selecting proper element type, the matrial model , the loading sequence and the process parametrs like friction and blank holding force for successful deep drawing pros\cess to estabish cylindrical cups.
- When increasing the BHF, the thickness stress increases and thickness strains decreases thereby the formation of wrinkles are restricted and prevents necking and rupture.
- The BHF of upto 130KN was safe for froming steel without introducing wrinkles and necking as compared to copper.
- The friction value of 0.05 between punch and blank and a BHF of 10KN is oberved to be wrinkles free forming for steel as compared to copper.
- The optimum BHF to eliminate wrinkles largely depends on its mechanical flow properties of the material considered.

The outcome of the simulation studies reveled the fact that it is essential to control the slip between the blank and its holder and die and if the slip is restrained too much, the material will undergo severe stretching, thus potentially causing necking and rupture. If the blank can slide too easily, the material will be drawn in completely and high compressive circumferential stresses will be developed, causing wrinkling in the drawn product. Appropriate conditions are proposed and studied in this thesis to control blank holding forces and friction in order to limit the circumferential stresses there by wrinkles are minimized in the product.

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REFERENCES

[1] **R.K.Jain**, **"***Production Technology"*,Khanna Publishers,2006.
[2] **Amitabha Ghosh,Asok Kumar Malik, "***Manufacturing Science"*,Affiliated East- west Press Private Limited,2000.
[3] **P.N.Rao**,**"***ManufacturingTtechnology,"*TataMcGraw-Hill,1999.
[4] **Dr. Waleed Khalid Jawad "***Investigation of Contact Interface between the Punch and Blank in Deep DrawingProcess"*Eng.&Technology,Vol.25,No.3,2007.
[5] **A. Wifi** co-operating with **A. Mosallam "***Some aspects of blank-holder* force *schemes in deep drawing" process,*Department of Mechanical Design and Production, Faculty of Engineering, Cairo University,Giza12316,EgyptAMMEJ.,VOLUME,24,2007
[6] **L. Ben Ayed, A. Delamézière, J.L. Batoz, C. Knopf-Lenoir "***optimization and control of the blank holder force in sheet metal stamping with application to deep drawing of a cylindrical cup"* European Congress on Computational Methods in Applied Sciences and Engineering ECCOMAS 2004.
[7] **Jonathan Mckinley"** Warm Forming of Aluminum Brazing Sheet".
[8] **Shang, H.M., Chau, F.S., Tay, C.J. and Toh, S.L.,** "Hydro forming Sheet Metal Into Axisymmetrical Shells With Draw-In of Flange Permitted" Transaction of the **ASME**, Vol. 107, 1985, pp 372-378.
[9] **Lee, P.K., Choi, C.Y. and Hsu, T.**C., "Effect of Draw-In on Formability in Axisymmetric Sheet Metal Forming,"J.ofEngineeringforIndustry,Nov.,1973,pp925-930.

Text Extraction in Video

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ABSTRACT:

The detection and extraction of scene and caption text from unconstrained, general purpose video is an important research problem in the context of content-based retrieval and summarization of visual information. The current state of the art for extracting text from video either makes simplistic assumptions as to the nature of the text to be found, or restricts itself to a subclass of the wide variety of text that can occur in broadcast video. Most published methods only work on artificial text (captions) that is composited on the video frame. Also, these methods have been developed for extracting text from images that have been applied to video frames. They do not use the additional temporal information in video to good effect.This thesis presents a reliable system for detecting, localizing, extracting, tracking and binarizing text from unconstrained, general-purpose video. In developing methods for extraction of text from video it was observed that no single algorithm could detect all forms of text. The strategy is to have a multi-pronged approach to the problem, one that involves multiple methods, and algorithms operating in functional parallelism. The system utilizes the temporal information available in video. The system can operate on JPEG images, MPEG-1 bit streams, as well as live video feeds. It is also possible to operate the methods individually and independently.

Keywords — *Detection, Extraction, Frame, Images and Tracking.*

I. INTRODUCTION:

As computer, compress technology, storage media and high speed communication skill are developed dramatically; digital video has become one of the most important elements in many applications such as education, news and games. Multimedia data are also getting bigger than before. In order to extract and search important information from a huge amount of video data, we need to extract text from video. Text is obviously an important element in video. So extracting text appears as a key clue for understanding contents of video and for instance for classifying automatically some videos. Videotext detection and recognition has been identified as one of the key components for the video retrieval and analysis system. Videotext detection and recognition can be used in many applications, such as semantic video indexing, summarization, video surveillance and security, multilingual video information access, etc. Videotext can be classified into two broad categories: Graphic text and scene text. Graphic text or text overlay is the videotext added mechanically by video editors, examples include the news/sports video caption, movie credits etc. Scene texts are the videotexts embedded in the real-world objects or scenes, examples include street name, car license number, and the number/name on the back of a soccer player. This report is to address the problem of accurately detecting and extracting the graph videotexts for videotext recognition. Although the overlay text is manually added into the video, the experiments showed they are even as hard to extract as many video objects, such as face, people etc.

This is due to the following reasons:

1. Many overlay texts present in the cluttered scene background.
2. There is no consistent color distribution for texts in different videos. Consequently, the color-tone based approach widely used in face or people detection application actually cannot be applied in text detection.
3. The size of the text regions may be very small such that when the color segmentation based approach is applied, the small text region may merge into the large non-text regions in its vicinity. Here we used edge detection based method for extracting the text and it is implemented using Mat lab. Here the two critical angles are defines and the text is extracted and recognized using the coincidence of the edges of the image with the threshold defined based on the critical angles.

II. MAIN CONCEPTS:

Text extraction in video consists in three steps. The first one is to find text region in original images. Then the text needs to be separated from background. And finally a binary image has to be produced (for example, text is white and background is black) Difficulties of such a project can be classified in following main categories:

1. Background and text may be ambiguous.
2. Text color may change: text can have arbitrary and non-uniform color.
3. Background and text are sometimes reversed.
4. Text may move.
5. Unknown text size, position, orientation, and layout**:** captions lack the structure usually associated with documents.
6. Unconstrained background**:** the background can have colors similar to the text color. The background may include streaks that appear very similar to character strokes.
7. Color bleeding**:** lossy video compression may cause colors to run together.
8. Low contrast**:** low bit-rate video compression can cause loss of contrast.

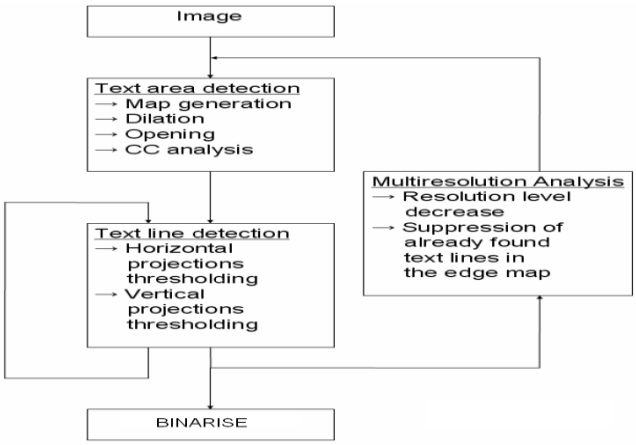


Figure 1: Flow Chart for Text Extraction.

Figure 2: Text Extraction Results

This can be extended by including Text Recognition to it. Also extending it to video, real time operation, the program can work surprisingly well and useful. Adding all these features we can use this project for class automatically some images, for the retrieval and analysis system and in many applications, such as semantic video indexing, summarization, video surveillance and security, multilingual video information accessed. During the course of this research effort several contributions were made to enable reliable extraction of text in video. A multi-threaded multi-architecture prototype system was developed in C++ which operates on JPEG images, uncompressed video, MPEG compressed video, and live video. Various methods which were proposed for extraction of text from images and video in the literature were studied and a critical analysis of their success in detecting text from unconstrained general purpose video was presented. Some of the methods which seemed promising were implemented and some enhanced to enable a better performance. A detailed evaluation of these methods was conducted on a challenging dataset. For this evaluation a ground truth was developed which allowed pixel strict objective evaluation. Potential problems with using such a ground truth were discovered and presented. It was noticed that, cumulatively, different methods were able to localize almost all instances of the text appearing in the video. To address this observation, algorithm fusion methods were studied and solutions presented. The solution utilized human supervision on a small portion of the dataset to enable improved results. In addition, a multifeature text extraction algorithm was developed that applied promising feature extraction algorithms in cascaded fashion. It is seen from the results that further research in this area is needed to make indexing of video a reality. It is shown that algorithm fusion is a promising direction to achieve good localizations.

III. TEXT DETECTION

Since we have no a priori information on whether a given video frame contains text, the first step is to detect whether text of any sort exists in the frame. This serves as a pre filtering operation to avoid more expensive processing on all frames and seeks to give a binary answer to the question of whether text exists in the frame. This stage needs to be fast and should prefer false alarm errors to missed detection errors since the former can be rejected at later stages.

The term text detection here means the distinguishing the letters or the characters from the image part. This is the process of determining whether a given part or part of the image is a text or some other figures. Text detection generally can be classified into two categories:

3.1 ***BOTTOM-UP METHODS***: They segment images into regions and group "character" regions into words. . The input image is segmented based on the monochromatic nature of the text components using a split-and-merge algorithm. Segments that are too small and too large are filtered out. After dilation, motion information and contrast analysis are used to enhance the extracted results. The methods, to some degree, can avoid performing text detection. Due to the difficulty of developing efficient segmentation algorithms for text in complex background, the methods are not robust for detecting text in many camera-based images and videos.

3.2 ***TOP-DOWN METHODS:*** They first detect text regions in images using filters and then perform bottom-up techniques inside the text regions. These methods are able to process more complex images than bottom-up approaches. Top-down methods are also divided into two categories

1. Heuristic methods: they use heuristic filters
2. **Machine learning methods**: they use trained filters

Here we are using heuristic method of text extraction. This method of text extraction can be performed in two different approaches. Each of both uses the characteristics of artificial text.

1. Connected regions approach: The main idea of this approach is that a letter can be considered as a homogeneous region (using our restrictions), and thus it could be very useful to divide the frame into homogeneous regions. To compute such a division, a split-and-merge algorithm seems to be very adequate. Its concept is: while there is a non homogeneous region, then split it into four regions. And if two adjacent regions are homogeneous, then they can be merged. Then, using some size characterizations of the text (not too big and not too small), the inadequate regions will be deleted. The same process will be executed for the different frames, and the results will be temporally integrated in order to keep only the elements which are present in all the frames.

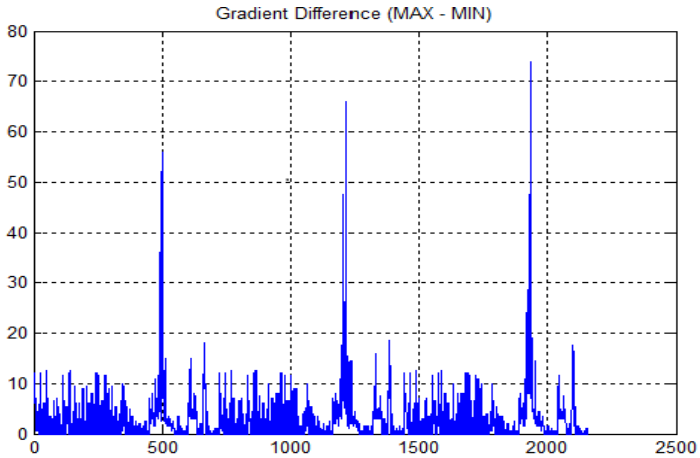
2. Edge detection approach: The main idea of this approach is that text contrasts a lot with background. The text will have a well defined edge that makes it possible to identify the text clearly. Thus, using edge detection concepts seems to be a

good idea. The edge detection is based on certain predefined critical angles called the threshold angles. The lines that coincide with these thresholds are identified as the text edges. After that the edge lengths will be computed, the length number of edges in x and y direction will be calculated and if it is higher than a certain threshold then it will be considered as a text area. Then each text area will be binarized using the luminance. For binarizing also we are using thresholds. The intermediate luminescence is taken as the threshold value and the areas which are brighter than the threshold is white and the other areas are black. So in a final result, the text will be in white and the background in black (or the inverse). Finally, the same process will be executed for the different frames, and the results will be temporally integrated in order to keep only the elements which are present in all the frames.

3. Extracting Text from Video. Thus, methods depending on page models and top-down page segmentation methods are not appropriate—we need to use more locally adaptive bottom-up methods with less dependence on regularity, uniform font size, availability of multiple lines etc. Also, most document analysis methods for text detection depend on an initial high quality binarization step from the original gray-scale image. In this case the background**:** Text recognition in document images has been an active research area for some time. However text recognition in broadcast quality digital video is a problem requiring different approaches. Unlike document images, video frames tend to have text not in orderly columns but in widely scattered areas, and fewer, separated lines. Also, video frames are typically noisy, low-resolution, and full-color with interlace artifacts. The text in a video frame can be multi-colored, multi-font, and/or be transparent, with the background showing through.

Some of the text pixels can share the colors of the background. Also the text region itself may be translucent. Thus, a global binarization step is unlikely to isolate the text. Video does, however, offer the advantage of temporal redundancy that can be exploited. This is that successive frames containing text are usually similar in the text region.

IV. WAVEFORM:



Consider a frame image F having I rows and J columns. Then the set of text blocks T can be determined using the dynamic range.

$M_{k,l} = \max(F(i, j))$ (4.1)

$M_{k,l} = \min(F(i, j))$ (4.2)

Where,

$\gamma k \leq i < \gamma (k + 1)$

$\gamma k \leq j < \gamma(l + 1)$

The bounds of k and l are given in Equation 4.3.

$k = 0, 1 \ldots (I/\gamma) - 1$

$l = 0, 1 \ldots (J/\gamma) - 1$ (4.3)

The dynamic range, d, is then defined as shown in Equation 4.4

dk,l =| Mk,l

− mk,l(4.4)

The set of blocks in the frame image F classified as text blocks are then given by 4.5

T={(K,l)} : ={d K,l >=t

d K,l=0}(4.5)

In this case, γ is set to 4. The above equations determine if the dynamic range of the block is either greater than or equal to a distinct threshold τ or is nearly 0, the block is classified as a text block. In addition, the detected blocks are validated by thresholding the number of classified text blocks to a preset threshold set to 0.1. In practical application, the method excludes certain areas of the frame image boundary to reduce false alarms. Empirically determined values of τ, where the method performs fairly well, range from 45 to 60.

V. RESULTS

Figure 5.1 shows sample resulting image frames after applying the intensity stage of the Method-A. It is seen that the application of such a cascaded set of constraints enables removal of most false alarms, while detecting almost all instances of the text appearing in the video including Arabic language credit titles. In Figure 5.1 almost all instances of text are detected save for the text in the backdrop behind the news anchor which are of very low contrast.

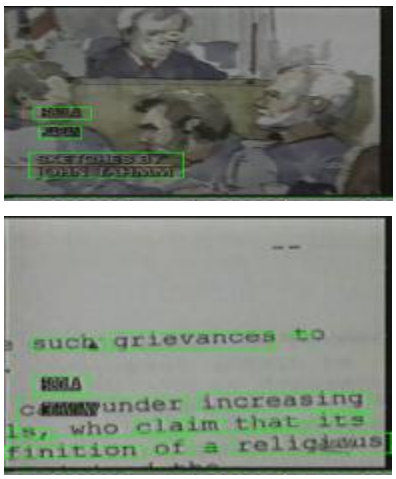


Fig: 5.1 Text localization reults

VI. CONCLUSION:

In many ways the result of these experiments are both surprisingly good and surprisingly bad. For images without definite edges the program may not work properly. But it will work perfectly for image texts which have prominent edge. This can be extended by including Text Recognition to it. Also extending it to video, real time operation, the program can work surprisingly well and useful. Adding all these features we can use this project for classifying automatically some images, for the retrieval and analysis system and in many applications, such as semantic video indexing, summarization, video surveillance and security, multilingual video information access etc. During the course of this research effort several contributions were made to enable reliable extraction of text in video. A multi-threaded multi-architecture prototype system was developed in C++ which operates on JPEG images, uncompressed video, MPEG compressed video, and live video. Various methods which were proposed for extraction of text from images and video in the literature were studied and a critical analysis of their success in detecting text from unconstrained general purpose video was presented. Some of the methods which seemed promising were implemented and some enhanced to enable a better performance. A detailed evaluation of these methods was conducted on a challenging dataset. For this evaluation a ground truth was developed which allowed pixel strict objective evaluation. Potential problems with using such a ground truth were discovered and presented. It was noticed that, cumulatively, different methods were able to localize almost all instances of the text appearing in the video. To address this observation, algorithm fusion methods were studied and solutions presented. The solution utilized human supervision on a small portion of the dataset to enable improved results. In addition, a multifeature text extraction algorithm was developed that applied promising feature extraction algorithms in cascaded fashion. It is seen from the results that further research in this area is needed to make indexing of video a reality. It is shown that algorithm fusion is a promising direction to achieve good localizations. Yet, much work is needed on this topic to enable detection of information from the video source to provide unsupervised algorithm fusion.

REFERENCES:

[1.] J.B. Bosch and E.M. Ehlers. Remote Sensing of Characters on 3D Objects. Computers&ndustrial Engineering, 33(1-2):429–432, 1997.

[2.] N. Chaddha, R. Sharma, A. Agrawal, and A. Gupta. Text Segmentation in Mixed– Mode Images. In 28th Asilomar Conference on Signals, Systems and Computers, Pages 1356–1361, October 1995.

[3.] N.-S. Chang and K.-S. Fu. Query-by-Pictorial-Example. IEEE Transactions on Software Engineering, 6(6):519–524, 1980.

Improved Performance for "Color to Gray and Back" For Orthogonal transforms using Normalization

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ABSTRACT:

The paper shows performance comparison of two proposed methods with Image transforms alias Cosine, Sine, Haar & Walsh using Normalization for 'Color to Gray and Back'. The color information of the image is embedded into its gray scale version using transform and normalization method. Instead of using the original color image for storage and transmission, gray image (Gray scale version with embedded color information) can be used, resulting into better bandwidth or storage utilization. Among the two algorithms considered the first algorithm give better performance as compared to the second algorithm. In our experimental results first algorithm for Discreet Cosine Transform (DCT) using Normalization gives better performance in 'Color to gray and Back' w.r.t all other transforms in method 1 and method 2. The intent is to achieve compression of 1/3 and to print color images with black and white printers and to be able to recover the color information afterwards.

Key Words: *Color Embedding; Color-to-Gray Conversion; Transforms; Normalization; Compression.*

I. INTRODUCTION

Digital images can be classified roughly to 24 bit color images and 8bit gray images. We have come to tend to treat colorful images by the development of various kinds of devices. However, there is still much demand to treat color images as gray images from the viewpoint of running cost, data quantity, etc. We can convert a color image into a gray image by linear combination of RGB color elements uniquely. Meanwhile, the inverse problem to find an RGB vector from a luminance value is an ill-posed problem. Therefore, it is impossible theoretically to completely restore a color image from a gray image. For this problem, recently, colorization techniques have been proposed [1]-[4]. Those methods can re-store a color image from a gray image by giving color hints. However, the color of the restored image strongly depends on the color hints given by a user as an initial condition subjectively.

In recent years, there is increase in the size of databases because of color images. There is need to reduce the size of data. To reduce the size of color images, information from all individual color components (color planes) is embedded into a single plane by which gray image is obtained [5][6][7][8]. This also reduces the bandwidth required to transmit the image over the network.Gray image, which is obtained from color image, can be printed using a black-and-white printer or transmitted using a conventional fax machine [6]. This gray image then can be used to retrieve its original color image.

In this paper, we propose two different methods of color-to-gray mapping technique using transforms and normalization [8][9], that is, our method can recover color images from color embedded gray images with having almost original color images. In method 1 the color information in normalized form is hidden in HL and HH area of first component as in figure 1. And in method 2 the color information in normalize form is hidden in LH and HH area of first component as in figure 1. Normalization is the process where each pixel value is divided by 256 to minimize the embedding error [9].

The paper is organized as follows. Section 2 describes various transforms. Section 3 presents the proposed system for "Color to Gray and back". Section 4 describes experimental results and finally the concluding remarks are given in section 5.

II. TRANSFORMS

2.1 DCT (Discrete Cosine Transform) [9][12]

The NxN cosine transform matrix C={c(k,n)},also called the Discrete Cosine Transform(DCT),is defined as

$$c(k,n)=\begin{cases}\dfrac{1}{\sqrt{N}} & k=0, 0\le n\le N-1\\ \sqrt{\dfrac{2}{N}}\cos\dfrac{\Pi(2n+1)k}{2N} & 1\le k\le N-1, 0\le n\le N-1\end{cases} \quad \text{-----(1)}$$

The one-dimensional DCT of a sequence {u(n),0≤n≤N-1} is defined as

$$v(k)=\alpha(k)\sum_{n=0}^{N-1}u(n)\cos\left[\frac{\Pi(2n+1)k}{2N}\right] \quad 0\le k\le N-1 \quad \text{-----(2)}$$

Where $\alpha(0)=\dfrac{1}{\sqrt{N}}, \alpha(k)=\sqrt{\dfrac{2}{N}}$ *for* $1\le k\le N-1$

The inverse transformation is given by

$$u(n)=\sum_{k=0}^{N-1}\alpha(k)v(k)\cos\left[\frac{\Pi(2n+1)k}{2N}\right], 0\le n\le N-1 \quad \text{-----(3)}$$

2.2 DST (Discrete Sine Transform) [9]

The NxN sine transform matrix $\Psi=\{\Psi(k,n)\}$, also called the Discrete Sine Transform (DST), is defined as

$$\Psi(k,n)=\sqrt{\frac{2}{N+1}}\sin\frac{\Pi(k+1)(n+1)}{N+1} \quad \text{-----(4)}$$

0≤k, n≤N-1

The sine transform pair of one-dimensional sequences is defined as

$$v(k)=\sqrt{\frac{2}{N+1}}\sum_{n=0}^{N-1}u(n)\sin\frac{\Pi(k+1)(n+1)}{N+1} \quad 0\le k\le N-1 \quad \text{-----(5)}$$

The inverse transformation is given by

$$u(n)=\sqrt{\frac{2}{N+1}}\sum_{n=0}^{N-1}v(k)\sin\frac{\Pi(k+1)(n+1)}{N+1} \quad 0\le n\le N-1 \quad \text{-----(6)}$$

2.3 Haar Transfrom [9][10]

The Haar wavelet's mother wavelet function φ (t) can be described as

$$\varphi(t)=\begin{cases}1 & ,0\le t\le\dfrac{1}{2}\\ -1 & ,\dfrac{1}{2}\le t\le 1\\ 0 & ,Otherwise\end{cases} \quad \text{-----(7)}$$

And its scaling function $\varphi(t)$ can be described as,

$$\varphi(t)=\begin{cases}1 & ,0\le t\le 1\\ 0 & ,Otherwise\end{cases} \quad \text{-----(8)}$$

2.4 Walsh Transform [9][11][12]

Walsh transform matrix is defined as a set of N rows, denoted Wj, for j = 0, 1, ..., N - 1, which have the following properties[9]

1) Wj takes on the values +1 and -1.
2) Wj[0] = 1 for all j.
3) Wj xWkT =0, for j ≠ k and Wj xWKT, Wj has exactly j zero crossings, for j = 0, 1, ...N-1.
4) Each row Wj is even or odd with respect to its midpoint.
5) Transform matrix is defined using a Hadamard matrix of order N. The Walsh transform matrix row is the row of the Hadamard matrix specified by the Walsh code index, which must be an integer in the
6) range [0... N-1]. For the Walsh code index equal to an integer j, the respective Hadamard output code has exactly j zero crossings, for j = 0, 1... N - 1.

III. PROPOSED SYSTEM

In this section, we propose a two new color-to-gray mapping algorithm and color recovery method.

3.1 Method 1: [6][7][8]

The 'Color to Gray and Back' has two steps as Conversion of Color to Matted Gray Image with color embedding into gray image & Recovery of Color image back.

3.1.1 Color-to-gray Step

1. First color component (R-plane) of size NxN is kept as it is and second (G-plane) & third (B-plane) color component are resized to N/2 x N/2.
2. Second & Third color component are normalized to minimize the embedding error.
3. Transform i.e. DCT, DST, Haar or Walsh to be applied to first color components of image.
4. First component to be divided into four subbands as shown in figure1 corresponding to the low pass [LL], vertical [LH], horizontal [HL], and diagonal [HH] subbands, respectively.
5. HL to be replaced by normalized second color component, HH to replace by normalized third color component.
6. Inverse Transform to be applied to obtain Gray image of size N x N.

LL	LH
HL	HH

Figure 1: Sub-band in Transform domain

3.1.2 Recovery Step

1. Transform to be applied on Gray image of size N x N to obtain four subbands as LL, LH, HL and HH.
2. Retrieve HL as second color component and HH as third color component of size N/2 x N/2 and the the remaining as first color component of size NxN.
3. De-normalize Second & Third color component by multiplying it by 256.
4. Resize Second & Third color component to NxN.
5. Inverse Transform to be applied on first color component.
6. All three color component are merged to obtain Recovered Color Image.

3.2 Method 2: [6][7][8][9]

3.2.1 Color-to-gray Step

1. First color component (R-plane) of size NxN is kept as it is and second (G-plane) & third (B-plane) color component are resized to N/2 x N/2.
2. Second & Third color component are normalized to minimize the embedding error.
3. Transform i.e. DCT, DST, Haar or Walsh to be applied to first color components of image.
4. First component to be divided into four subbands as shown in figure1 corresponding to the low pass [LL], vertical [LH], horizontal [HL], and diagonal [HH] subbands, respectively.
5. LH to be replaced by normalized second color component, HH to replace by normalized third color component.
6. Inverse Transform to be applied to obtain Gray image of size N x N.

3.2.2 Recovery Step

1. Transform to be applied on Gray image of size N x N to obtain four subbands as LL, LH, HL and HH.
2. Retrieve LH as second color component and HH as third color component of size N/2 x N/2 and the the remaining as first color component of size NxN.
3. De-normalize Second & Third color component by multiplying it by 256.
4. Resize Second & Third color component to NxN.
5. Inverse Transform to be applied on first color component.
6. All three color component are merged to obtain Recovered Color Image.

IV. Results & Discursion

These are the experimental results of the images shown in figure 2 which were carried out on DELL N5110 with below Hardware and Software configuration.

Hardware Configuration:

1. Processor: Intel(R) Core(TM) i3-2310M CPU@ 2.10 GHz.
2. RAM: 4 GB DDR3.
3. System Type: 64 bit Operating System.

Software Configuration:

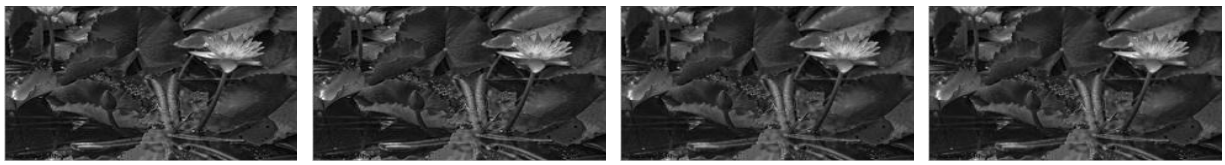
1. Operating System: Windows 7 Ultimate [64 bit].
2. Software: Matlab 7.0.0.783 (R2012b) [64 bit].

The quality of 'Color to Gray and Back' is measured using Mean Squared Error (MSE) of original color image with that of recovered color image, also the difference between original gray image and reconstructed gray image (where color information is embedded) gives an important insight through user acceptance of the methodology. This is the experimental result taken on 10 different images of different category as shown in Figure 2. Figure 3 shows the sample original color image, original gray image and its gray equivalent having colors information embedded into it, and recovered color image using method 1 and method 2 for DCT, DST, Haar and Walsh transform. As it can be observed that the gray images obtained from these methods does not have any matting effect it does not give any clue that something is hidden in gray image, which is due to the normalizing as it reduces the embedding error.

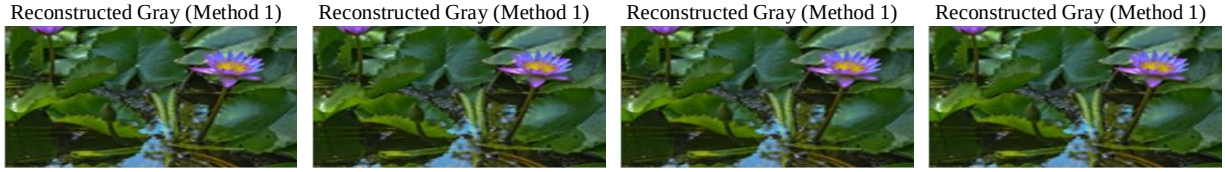
Figure 2: Test bed of Image used for experimentation.

Oroginal Color | Original Gray

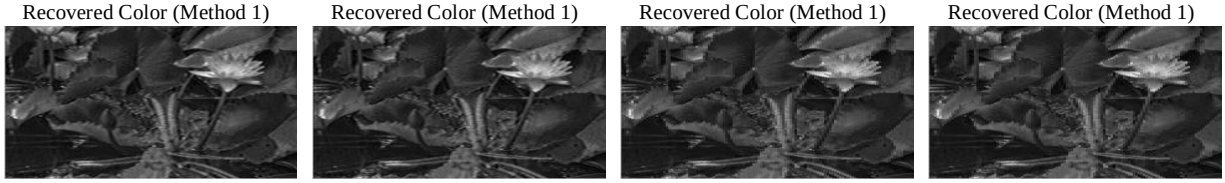
DCT | DST | Haar | Walsh



Reconstructed Gray (Method 1) | Reconstructed Gray (Method 1) | Reconstructed Gray (Method 1) | Reconstructed Gray (Method 1)



Recovered Color (Method 1) | Recovered Color (Method 1) | Recovered Color (Method 1) | Recovered Color (Method 1)



Reconstructed Gray (Method 2) | Reconstructed Gray (Method 2) | Reconstructed Gray (Method 2) | Reconstructed Gray (Method 2)

Recovered Color (Method 2) | Recovered Color (Method 2) | Recovered Color (Method 2) | Recovered Color (Method 2)

Figure 3: Color to gray and Back of sample image using Method 1 and Method 2

Table 1: MSE between Original Gray-Reconstructed Gray Image

	DCT		DST		Haar		Walsh	
	Method 1	Method 2	Method 1	Method 2	Method 1	Method 2	Method 1	Method 2
Img 1	8166.1	8121.3	8163.3	8119.9	8094.8	8025	8094.8	8025
Img 2	16102	16085	16098	16083	16081	16056	16081	16056
Img 3	5009.7	4999.3	5007.6	4997.9	4960.3	4952.8	4960.3	4952.9
Img 4	15365	15364	15353	15359	15340	15354	15340	15354
Img 5	5176.4	5174.5	5176.6	5174.6	5169.9	5157.2	5169.9	5157.2
Img 6	2275.5	2270.8	2274.9	2270.6	2264.1	2258.5	2264.1	2258.5
Img 7	21686	21713	21673	21701	21687	21707	21687	21707
Img 8	26794	26779	26777	26766	26789	26776	26789	26776
Img 9	4736.3	4734.8	4735.7	4732.4	4730.1	4728.5	4730.2	4728.6
Img 10	3586.7	3565.3	3586.9	3565.7	3572.5	3544.6	3572.5	3544.6
Average	10889.77	10880.7	10884.6	10877.01	10868.87	10855.96	10868.88	10855.98

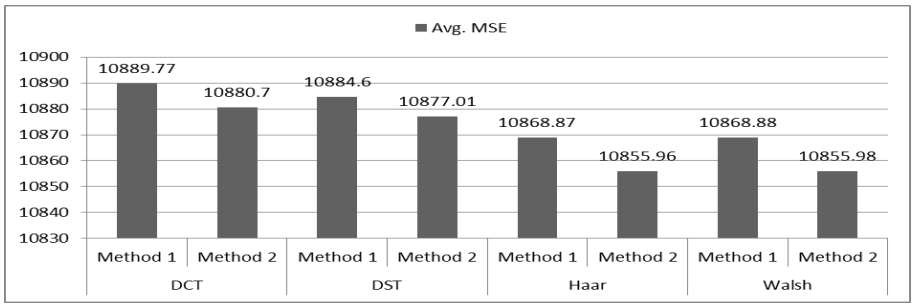


Figure 4: Average MSE of Original Gray w.r.t Reconstructed Gray for Method 1 & Method 2

Table 2: MSE between Original Color-Recovered Color Image

	DCT		DST		Haar		Walsh	
	Method 1	Method 2	Method 1	Method 2	Method 1	Method 2	Method 1	Method 2
Img 1	342.0067	366.6414	342.9398	367.2088	386.8236	423.3483	386.8729	423.3483
Img 2	75.8286	81.4437	77.9538	82.28	94.1871	99.7293	94.2068	99.7293
Img 3	192.5905	203.287	193.5373	204.4691	219.2903	236.8208	219.3281	236.8208
Img 4	79.1031	80.6879	81.9712	82.5248	96.5088	90.456	96.511	90.456
Img 5	20.5683	22.0376	20.461	21.947	25.5576	35.3552	25.5559	35.3552
Img 6	54.5566	56.3903	54.8799	56.5376	62.8413	64.5713	62.8463	64.5713
Img 7	85.0285	78.7563	91.6735	85.1475	88.1694	86.4924	88.1612	86.4924
Img 8	35.1006	45.3876	39.0699	49.1969	40.256	50.2221	40.2682	50.2221
Img 9	39.6396	40.2827	41.0451	41.9209	47.9449	48.5895	47.94	48.5895
Img 10	145.4311	155.213	145.3459	154.9879	155.5559	167.9644	155.5542	167.9644
Average	106.9854	113.0128	108.8877	114.6221	121.7135	130.3549	121.7245	130.3549

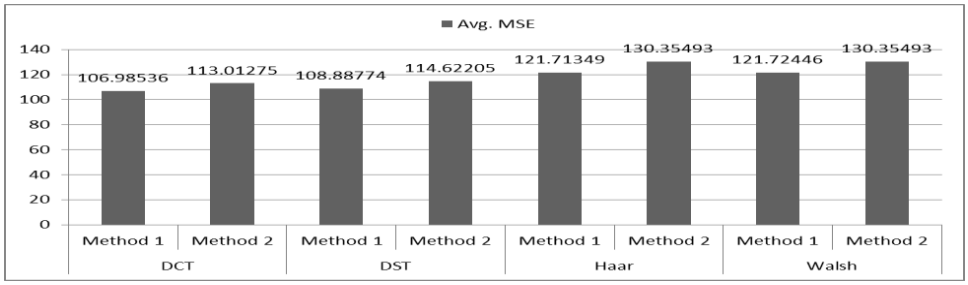


Figure 5: Average MSE of Original Color w.r.t Recovered Color for Method 1 & Method

It is observed in Table 2 and Figure 5 that DCT using method 1 gives least MSE between Original Color Image and the Recovered Color Image. Among all considered image transforms, DCT using method 1 gives best results. And in Table 1 and Figure 4 it is observed that Haar using method 2 gives least MSE between Original Gray Image and the Reconstructed Gray Image. Among all considered image transforms, less distortion in Gray Scale image after information embedding is observed for Haar Transform using method 2. The quality of the matted gray is not an issue, just the quality of the recovered color image matters. This can be observed that when DCT using method 1 is applied the recovered color image is of best quality as compared to other image transforms used in method 1 and method 2.

V. CONCLUSION

This paper have presented two method to convert color image to gray image with color information embedding into it in two different regions and method of retrieving color information from gray image. These methods allows one to achieve 1/3 compression and send color images through regular black and white fax systems, by embedding the color information in a gray image. These methods are based on transforms i.e DCT, DST, Haar, Walsh and Normalization technique. DCT using method 1 is proved to be the best approach with respect to other transforms using method 1 and method 2 for 'Color-to-Gray and Back' Our next research step could be to test wavelet transforms and hybrid wavelets for 'Color-to-Gray and Back'.

REFERENCES

[1] T. Welsh, M. Ashikhmin and K.Mueller, Transferring color to grayscale image, Proc. ACM SIGGRAPH 2002, vol.20, no.3, pp.277-280, 2002.

[2] A. Levin, D. Lischinski and Y. Weiss, Colorization using Optimization, ACM Trans. on Graphics, vol.23, pp.689-694, 2004.

[3] T. Horiuchi, "Colorization Algorithm Using Probabilistic Relaxation," Image and Vision Computing, vol.22, no.3, pp.197-202, 2004.

[4] L. Yatziv and G.Sapiro, "Fast image and video colorization using chrominance blending", IEEE Trans. Image Processing, vol.15, no.5, pp.1120-1129, 2006.

[5] H.B. Kekre, Sudeep D. Thepade, "Improving `Color to Gray and Back` using Kekre's LUV Color Space." IEEE International Advance Computing Conference 2009, (IACC 2009),Thapar University, Patiala,pp 1218-1223.

[6] Ricardo L. de Queiroz,Ricardo L. de Queiroz, Karen M. Braun, "Color to Gray and Back: Color Embedding into Textured Gray Images" IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 15, NO. 6, JUNE 2006, pp 1464- 1470.

[7] H.B. Kekre, Sudeep D. Thepade, AdibParkar, "An Extended Performance Comparison of Colour to Grey and Back using the Haar, Walsh, and Kekre Wavelet Transforms" International Journal of Advanced Computer Science and Applications (IJACSA) , 0(3), 2011, pp 92 - 99.

[8] H.B. Kekre, Sudeep D. Thepade, Ratnesh Chaturvedi & Saurabh Gupta, "Walsh, Sine, Haar& Cosine Transform With Various Color Spaces for 'Color to Gray and Back'", International Journal of Image Processing (IJIP), Volume (6) : Issue (5) : 2012, pp 349-356.

[9] H. B. Kekre, Sudeep D. Thepade, Ratnesh N. Chaturvedi, " NOVEL TRANSFORMED BLOCK BASED INFORMATION HIDING USING COSINE, SINE, HARTLEY, WALSH AND HAAR TRANSFORMS", International Journal of Advances in Engineering & Technology, Mar. 2013. ©IJAET ISSN: 2231-1963, Vol. 6, Issue 1, pp. 274-281

[10] Alfred Haar, "ZurTheorie der orthogonal en Funktionensysteme" (German), Mathematische Annalen, Volume 69, No 3, pp 331 – 371, 1910.

[11] J Walsh, "A closed set of normal orthogonal functions", American Journal of Mathematics, Volume 45, No 1, pp 5-24, 1923.

[12] Dr. H. B. Kekre, DrTanuja K. Sarode, Sudeep D. Thepade, Ms.SonalShroff, "Instigation of Orthogonal Wavelet Transforms using Walsh, Cosine, Hartley, Kekre Transforms and their use in Image Compression", International Journal of Computer Science and Information Security, Volume 9, No 6,pp 125-133, 2011.

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Chain Code Based Handwritten Cursive Character Recognition System with Better Segmentation Using Neural Network

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ABSTRACT:

Character recognition plays an important role in many resent applications. Pattern recognition deals with categorization of input data. It is easy to recognize normal character but in cursive character we have to find out the boundary of a character that's why we have to apply better slant and segmentation techniques. A proper feature extraction method can increase the recognition ratio. In this paper, a chain code based feature extraction method is investigated for developing HCCR system. Chain code is working based on 4-neighborhood or 8–neighborhood methods. In this paper, 8–neighborhood method has been implemented which allows generation of eight different codes for each character. After feature extraction method, Classification techniques have been used for training and testing of Neural Network and other classifier.

Keywords: *Pattern recognition, handwritten cursive character recognition (HCCR), segmentation with slant correction, feature extraction, chain code, neural network.*

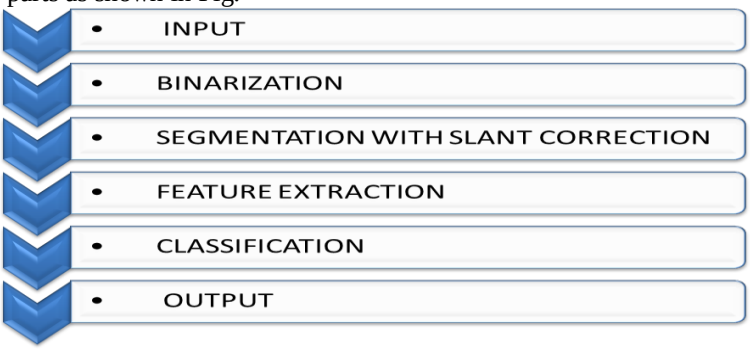
I. INTRODUCTION

Pattern recognition is a field of study whose general goal is the classification of objects into a number of categories. Handwriting recognition has always been a challenging task in pattern recognition. Handwritten digit recognition is a system widely used in the United States. This system is developed for zip code or postal code recognition that can be employed in mail sorting.it is very useful for document digitalization.

For cursive character recognition first we have to do binarization. After that slant correction and segmentation will make character in proper manner. Which is useful for find out the starting and ending boundary of particular character . Next process of this mechanism is to design a dataset for feature extraction and another data set is for to train the classifier using Neural Network. In next process different feature extraction methods are applied on input data set and extract feature from it. This extracted feature applied on different classifier which was already trained trough input data set which matches between feature and trained data.

II. HCCR SYSTEM

This system is useful to find out and recognize handwritten cursive character. the steps of HCCR can be divided in four major parts as shown in Fig.



(Figure 1: HCCR System)

2.1 Binarization

Binarization (thresholding) refers to the conversion of a gray-scale image into a binary image. Image is converted into 1s and 0s form after binarization next step is slant correction and segmentation.

2.2 Slant correction and Segmentation

Slant Correction: Slant correction in cursive writing is a very difficult task. Alignment of character is differing from person to person. The slant is the strokes from the vertical direction, depending on the writing style. To create segmentation first we have to correct the angle of character.

Slant angle= 34 degree

image after slant angle correction

Segmentation: In segmentation, the input image is segmented into individual character and then , each character is resized into m*n pixels towards the extracting the features.

Algorithm:

1. Calculate the size of image.
2. Frequency of black pixels in each row is counted in order to construct the row.
3. After row is segmented, individual character is segmented by finding boundary using connected components.
4. Repeat step 3 until all the character of row is segmented.
5. If all the raw of image is segmented then stop else go to step 2.

Line Segmentation: Text line detection has been performed by scanning the input image horizontally after that Frequency of black pixels in each row is counted in order to construct the line segment.

Word and Character Segmentation: After a line has been detected, each line is scanned vertically for word segmentation. It divides line of characters into words.

Character Segmentation:

Connected strings of characters

Isolated Characters

2.3 Feature Extraction

Any given image can be decomposed into several features. Feature extraction technique is accurately retrieve features of characters. It is useful to find out the amount of black pixels from given data.

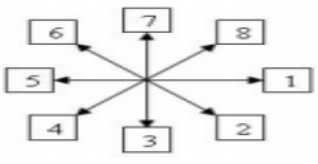
Useful properties might be:

- Aspect ratio
- Percentage of pixels over horizontal plan
- Percentage of pixels over vertical plan
- Number of storks

- **Chain Code Generation**

  Chain codes are used to represent the shape & boundary of connected characters. This representation is based on 4-connectivity or 8-connectivity of the segments. A chain code can be generated using boundary of an object in a clockwise direction and assigning a direction to the segments.

  First, we pick a starting pixel location anywhere on the object boundary. Our aim is to find the next pixel in the boundary. There must be an adjoining boundary pixel at one of the eight locations surrounding the current boundary pixel. By looking at each of the eight adjoining pixels, we will find at least one that is also a boundary pixel.



(Figure 2: 8-neighborhood Chain Code)

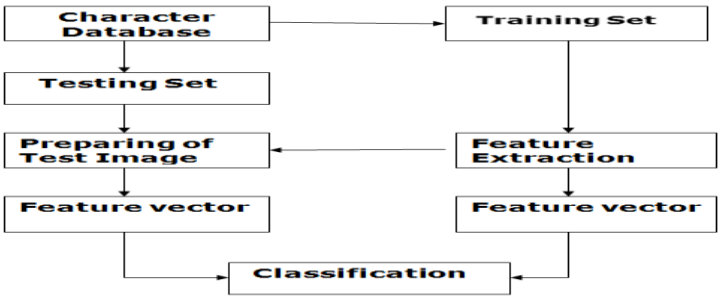
Algorithm for generating chain code considering 8- neighborhood is as follows:

Step 1: Find out starting point which has nonzero values and store it in first
Step 2: Initialize 0-7 total eight directions
Step 3: Travels all 8 neighbors
Step 4: Find first nonzero value
Step 5: Add it in to chain code list
Step 6: Move to next position
Step 7: Check whether we reach to first point or not if not then go to step 3.

2.4 Classification Technique.

- **Neural Network**

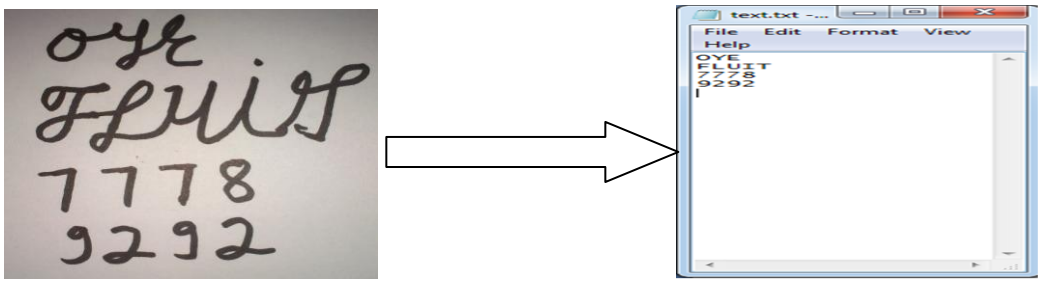
Artificial neural networks (ANN) provide the powerful simulation of the information processing and widely used in patter recognition application. The most commonly used neural network is a multilayer feed forward network which focus an input layer of nodes onto output layer through a number of hidden layers. In such networks, a back propagation algorithm is usually used as training algorithm for adjusting weights. The back propagation model or multi-layer perceptron is a neural network that utilizes a supervised learning technique. Typically there are one or more layers of hidden nodes between the input and output nodes. Besides, a single network can be trained to reproduce all the visual parameters as well as many networks can be trained so that each network estimates a single visual parameter. Many parameters, such as training data, transfer function, topology, learning algorithm, weights and others can be controlled in the neural network.



(Diagrammatic representation of how Neural Network works?)

Using this diagram we can easily identify how training and testing sets will work. First of all we have to train a data for Neural Network then use a testing data on it. After applying a feature extraction method to the data classification will apply and it compares testing data set and training data set After that it will generate a recognition rate.

3 Experimental Results and Output:



(Input Data) **(Final Result)**

III. CONCLUSION AND FUTURE WORK:

An accurate and an efficient off-line handwritten cursive character recognition system using a feature extraction method, namely, chain code is investigated. Using better feature extraction method like chain code we can achieve more accurate and efficient outcomes. To recognize a character we have to segment it properly therefore we have to apply better slant correction and segmentation logics. Characters must be written in proper manner.

This method gives recognition of 80% or more. Therefore applying more effective feature extraction will give a good recognition score. My next goal is to use other classification techniques like support vector machine (SVM) and hidden marcov model (HMM) too.

REFERENCES

[1] Anita Pal1 & Dayashankar Singh2, *"Handwritten English Character Recognition Using Neural Network"*, International Journal of Computer Science & Communication Vol. 1, No. 2, July-December 2010, pp. 141-144

[2] Tanmoy Som & Sumit Saha, *"Handwritten character recognition by using Neural-network and Euclidean distance metric"*, Mathematics dept., Assam University, Silchar, INDIA.

[3] Md.Mahbub Alam & Dr.M.Abul Kashem, "A Complete Bangla OCR System For Printed Characters", ISSN 2078-5828 (PRINT), ISSN 2218-5224 (ONLINE), VOLUME 01, ISSUE 01,2010 JCIT.

[4] Tanmoy Som & Sumit Saha, *"A new approach for slant angle correction and character segmentation of handwritten document"*, Department of mathematics Assam University, Silchar, INDIA.

[5] H. Izakian, S. A. Monadjemi, B. Tork Ladani, and K. Zamanifar, *"Multi-Font Farsi/Arabic Isolated Character Recognition Using Chain Codes"* World Academy of Science, Engineering and Technology 43 2008.

[6] H.Fujisawa, Y.Nakano and K.Kurino, *"Segmentation methods for character recognition from segmentation to document structure analysis"*. Proceeding of the IEEE, vol.80, and pp.1079-1092. 1992.

[7] H.Fujisawa, Y.Nakano and K.Kurino, *"Segmentation methods for character recognition from segmentation to document structure analysis"*. Proceeding of the IEEE, vol.80, and pp.1079-1092. 1992.

[8] C. J. C. Burges, "*A tutorial on support vector machines for pattern recognition. Data Mining and Knowledge Discovery"*, 1998.

[9] H.Fujisawa, Y.Nakano and K.Kurino, *"Segmentation methods for character recognition from segmentation to document structure analysis"*. Proceeding of the IEEE, vol.80, and pp.1079-1092. 1992.

[10] Yi-Kai Chen and Jhing-Fa Wang, *"Segmentation of Single-or Multiple-Touching Handwritten Numeral String Using Background and Foreground Analysis"*, IEEE PAMI vol.22, 1304-1317, 2000.

[11] Pal, U. and B.B. Chaudhuri, *"Indian script character recognition: A survey," Pattern Recognition"*, vol. 37, no.9, pp. 1887-1899, 2004.

[12] Ravi K Sheth, N.C.Chauhan, Mahesh M Goyani," *A Handwritten Character Recognition Systems using Correlation Coefficient"*, selected in International conference V V P Rajkot, 8-9 April 2011.

[13] Dewi Nasien, Habibollah Haron, Siti Sophiayati Yuhaniz *"The Heuristic Extraction Algorithms for Freeman Chain Code of Handwritten Character*", International Journal of Experimental Algorithms, (IJEA), Volume (1): Issue (1)

Strength of Ternary Blended Cement Concrete Containing Oil Palm Bunch Ash and Plantain Leaf Ash

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ABSTRACT:
This work investigated the compressive strength of ternary blended cement concrete containing oil palm bunch ash (OPBA) and plantain leaf ash (PLA). 105 concrete cubes of 150mm x 150mm x 150mm were produced with OPC-OPBA binary blended cement, 105 with OPC-PLA binary blended cement, and 105 with OPC-OPBA-PLA ternary blended cement, each at percentage OPC replacement with pozzolan of 5%, 10%, 15%, 20%, and 25%. Three cubes for each percentage replacement of OPC with pozzolan and the control were tested for saturated surface dry bulk density and crushed to obtain their compressive strengths at 3, 7, 14, 21, 28, 50, and 90 days of curing. The 90-day strengths obtained from ternary blending of OPC with equal proportions of OPBA and PLA were 27.00N/mm^2 for 5% replacement, 25.90N/mm^2 for 10% replacement, 25.10N/mm^2 for 15% replacement, 23.60N/mm^2 for 20% replacement, and 22.10N/mm^2 for 25% replacement, while that of the control was 24.60N/mm^2. The results show that high concrete strength values could be obtained with OPC-OPBA-PLA ternary blended cement at 50 days of hydration and above. Thus, OPC-OPBA-PLA ternary blended cement concrete could be used for various civil engineering and building works.

Key words:*Binary blended cement, ternary blended cement, concrete, pozzolan, oil palm bunch ash, plantain leaf ash.*

I. INTRODUCTION

The need to reduce the high cost of cement in order to provide accommodation for the populace in South Eastern Nigeria and other places has led to intensified efforts at sourcing local materials that could be used as partial replacement for Ordinary Portland Cement (OPC) in civil engineering and building works. Bakar, Putrajaya, and Abdulaziz (2010) assert that supplementary cementitious materials prove to be effective to meet most of the requirements of durable concrete and that blended cements are now used in many parts of the world. Calcium hydroxide [$Ca(OH)_2$] is obtained as one of the hydration products of OPC. When blended with Portland cement, a pozzolanic material reacts with the lime to produce additional calcium-silicate-hydrate (C-S-H), which is the main cementing component. Thus the pozzolanic material serves to reduce the quantity of the deleterious $Ca(OH)_2$ and increase the quantity of the beneficial C-S-H. Therefore, the cementing quality is enhanced if a good pozzolanic material is blended in suitable quantity with OPC (Dwivedia et al., 2006).

Much literature exists on binary blended systems where OPC is blended with different percentages of a pozzolan in making cement composites (Adewuyi and Ola, 2005; Elinwa and Awari, 2001; De Sensale, 2006; Saraswathy and Song, 2007). Attempts have been made to produce and use pozzolanicrice husk ash (RHA) commercially in several countries (Cisse and Laquerbe, 2000). Malhotra and Mehta (2004) have reported that ground RHA with finer particle size than OPC improves concrete properties, including that higher substitution amounts results in lower water absorption values and the addition of RHA causes an increment in the compressive strength. Mehta and Pirtz (2000) had earlier investigated the use of RHAto reduce temperature in high strength mass concrete and got result showing that RHA is very effective in reducing the temperature of mass concrete compared to OPC concrete. Sakr (2006) investigated the effects of silica fume (SF) and RHAon the properties of heavy weight concrete and found that these pozzolans gave higher concrete strengths than OPC concrete at curing ages of 28 days and above. Cordeiro, Filho, and Fairbairn (2009) carried elaborate studies of Brazilian RHA and rice straw ash (RSA) and demonstrated that grinding increases the pozzolanicity of RHA and that high strength of RHA, RSA concrete makes production of blocks with good bearing strength in a rural setting possible. Their study showed that combination of RHA or RSA with lime produces a weak cementitious material which could however be used to stabilize laterite and improve the bearing strength of the material. Habeeb and Fayyadh (2009) investigated the influence of RHA average particle size on the properties of concrete and found that at early ages the strength was comparable, while at the age of 28 days, finer RHA exhibited higher strength than the sample with coarser RHA. Wada et al. (2000) demonstrated that RHA mortar and concrete exhibited higher compressive strength than the control mortar and concrete. Agbede and Obam (2008) investigated the strength properties of OPC-RHA blended sandcrete blocks. They replaced various percentages of OPC with RHA and found that up to 17.5% of OPC can be replaced with RHA to produce good quality sandcrete blocks. Rukzon, Chindaprasirt, and Mahachai (2009) studied the effect of grinding on the chemical and physical properties of rice

husk ash and the effects of RHA fineness on properties of mortar and found that pozzolans with finer particles had greater pozzolanic reaction. Cordeiro, Filho, and Fairbairn (2009) also investigated the influence of different grinding times on the particle size distribution and pozzolanic activity of RHA obtained by uncontrolled combustion in order to improve the performance of the RHA. It was expected that the reduction of RHA particle size could improve the pozzolanic reactivity by reducing the adverse effect of the high-carbon content in the ash and increasing the homogeneity of the material. The study revealed the possibility of using ultrafine residual RHA containing high-carbon content in high-performance concrete. A number of researchers have also worked on sawdust ash and found good prospects in using binary blended cements made with sawdust ash (Elinwa, Ejeh, and Mamuda, 2008; Elinwa and Abdulkadir, 2011).

Some researchers have also investigated the possibility of ternary blended systems in order to further reduce the quantity of OPC in blended cements. Frı´as et al. (2005)studied the influence of calcining temperature as well as clay content in the pozzolanic activity of sugar cane straw-clay ashes-lime systems. All calcined samples showed very high pozzolanic activity and the fixation rate of lime (pozzolanic reaction) varied with calcining temperature and clay content. Elinwa, Ejeh, and Akpabio (2005) investigated the use of sawdust ash in combination with metakaolin as a ternary blend with 3% added to act as an admixture in concrete. Rukzon and Chindaprasirt (2006)investigated the strength development of mortars made with ternary blends of OPC, ground RHA, and classified fly ash (FA). The results showed that the strength at the age of 28 and 90 days of the binary blended cement mortar containing 10 and 20% RHA were slightly higher than those of the control, but less than those of FA. Ternary blended cement mixes with 70% OPC and 30% of combined FA and RHA produced strengths similar to that of the control. The researchers concluded that 30% of OPC could be replaced with the combined FA and RHA pozzolan without significantly lowering the strength of the mixes. Fadzil et al. (2008)also studied the properties of ternary blended cementitious (TBC) systems containing OPC, ground Malaysian RHA, and FA. They found that compressive strength of concrete containing TBC gave low strength at early ages, even lower than that of OPC, but higher than binary blended cementitious (BBC) concrete containing FA. At long-term period, the compressive strength of TBC concrete was comparable to the control mixes even at OPC replacement of up to 40% with the pozzolanic materials. Their results generally showed that the TBC systems could potentially be used in the concrete construction industry and could be particularly useful in reducing the volume of OPC used.

All the above works on ternary blended cements were based on blending OPC with one industrial by-product pozzolansuch as SF or FA and one agricultural by-product pozzolan, notably RHA. Being majorly agrarian, many communities in South Eastern Nigeria generate tons of agricultural and plant wastes such as oil palm bunch and plantain leaf as efforts are intensified toward food production and local economic ventures. There is currently very little or no literature on the possibility of binary blending of one of these Nigerian agricultural by-products with OPC and virtually no literature on ternary blending of any two of them with OPC. Thus, this work provides a pioneer investigation on the suitability of using two Nigerian agricultural by-products in ternary blend with OPC for concrete making. The compressive strength of ternary blended cement concrete containing oil palm bunch ash and plantain leaf ash was specifically investigated. The successful utilization of oil palm bunch ash and plantain leaf ash in ternary combination with OPC for making concrete would further add value to these wastes and reduce the volume of OPC currently required for civil engineering and building works.

II. METHODOLOGY

Oil palm bunch was obtained from palm oil mill in Ohaji-Egbema,Imo Stateand Plantain leaf from Ogbunikedistrict in Anambra State, both in South East Nigeria. These materials were air-dried, pulverized into smaller particles, and calcined into ashes in a locally fabricated furnace at temperatures generally below 650^{o}C. The oil palm bunch ash (OPBA) and plantain leaf ash (PLA) were sieved and large particles retained on the 600µm sieve were discarded while those passing the sieve were used for this work. No grinding or any special treatment to improve the quality of the ashes and enhance their pozzolanicity was applied because the researchers wanted to utilize simple processes that could be easily replicated by local community dwellers.

The OPBA had a bulk density of 820 Kg/m^3, specific gravity of 2.00, and fineness modulus of 1.98. The PLA had a bulk density of 760 Kg/m^3, specific gravity of 1.86, and fineness modulus of 1.36. Other materials used for the work are Ibeto brand of Ordinary Portland Cement (OPC) with a bulk density of 1650 Kg/m^3 and specific gravity of 3.13; river sand free from debris and organic materials with a bulk density of 1590 Kg/m^3, specific gravity of 2.68, and fineness modulus of 2.82; Crushed granite of 20 mm nominal size free from impurities with a bulk density of 1515 Kg/m^3, specific gravity of 2.96, and fineness modulus of 3.62; and water free from organic impurities.

A simple form of pozzolanicity test was carried out for each of the ashes. It consists of mixing a given mass of the ash with a given volume of Calcium hydroxide solution [$Ca(OH)_2$] of known concentration and titrating samples of the mixture against H_2SO_4 solution of known concentration at time intervals of 30, 60, 90, and 120 minutes using Methyl Orange as indicator at normal temperature. For each of the ashes the titre value was observed to reduce with time, confirming the ash as a pozzolan that fixed more and more of the calcium hydroxide, thereby reducing the alkalinity of the mixture.

A standard mix ratio of 1:2:4 (blended cement: sand: granite) was used for the concrete. Batching was by weight and a constant water/cement ratio of 0.6 was used. Mixing was done manually on a smooth concrete pavement. For binary blending with OPC, each of the ashes was first thoroughly blended with OPC at the required proportion and the homogenous blend was then mixed with the fine aggregate-coarse aggregate mix, also at the required proportions. For ternary blending, the two ashes were first blended in equal proportions and subsequently blended with OPC at the required proportions before mixing with the fine aggregate-coarse aggregate mix, also at the required proportions. Water was then added gradually and the entire concrete heap was mixed thoroughly to ensure homogeneity. The workability of the fresh concrete was measured by slump test, and the wet density was also determined. One hundred and five (105) granite concrete cubes of 150mm x

150mm x 150mm were produced with OPC-OPBA binary blended cement, one hundred and five (105) with OPC-PLA binary blended cement, and one hundred and five (105) with OPC-OPBA-PLA ternary blended cement, each at percentage OPC replacement with pozzolan of 5%, 10%, 15%, 20%, and 25%. An equal combination of OPBA and PLA was used in the ternary blended system. Twenty one control cubes with 100% OPC or 0% replacement with pozzolan were also produced. This gives a total of 336 concrete cubes. All the cubes were cured by immersion. Three cubes for each percentage replacement of OPC with pozzolan and the control were tested for saturated surface dry bulk density and crushed to obtain their compressive strengths at 3, 7, 14, 21, 28, 50, and 90 days of curing.

III. RESULTS AND DISCUSSION

The particle size analysis showed that both the OPBA and the PLA were much coarser than OPC, the reason being that the ashes were not ground to finer particles. Therefore, the compressive strength values obtained using them can still be improved upon when the ashes are ground to finer particles. The pozzolanicity test confirmed both ashes as pozzolans since they fixed some quantities of lime over time. The compressive strengths of the OPC-OPBA and OPC-PLA binary blended cement concretes as well as the OPC-OPBA-PLA ternary blended cement concrete are shown in tables 1 and 2 for 3-21 and 28-90 days of curing respectively.

The tables 1 and 2 show that concrete produced from ternary blend of OPC with equal proportions of OPBA and PLA have compressive strength values in between those of binary blends of OPC and OPBA on one hand and OPC and PLA on the other hand for all percentage replacements and curing ages. Also, the variation of strength for concrete produced from ternary blended cements is similar to those of concrete produced from binary blended cements for all percentage replacements and curing ages. More importantly for civil engineering and building construction purposes, the 90-day strengths obtained from ternary blending of OPC with equal proportions of OPBA and PLA were 27.00N/mm^2 for 5% replacement, 25.90N/mm^2 for 10% replacement, 25.10N/mm^2 for 15% replacement, 23.60N/mm^2 for 20% replacement, and 22.10N/mm^2 for 25% replacement, while that of the control was 24.60N/mm^2. Thus, the 90-day strength values for 5-15% replacement are higher than that of the control and those for 20-25% replacement are not much less than that of the control. The results in table 2 show that high concrete strength values could be obtained with OPC-OPBA-PLA ternary blended cement at 50 days of hydration and above.

Table 1. Compressive strength of blended OPC-OPBA-PLA cement concrete at 3-21 days of curing

OPC Plus	**Compressive Strength (N/mm^2) for**					
	0% Poz.	**5% Poz.**	**10% Poz.**	**15% Poz.**	**20% Poz.**	**25% Poz.**
	Strength at 3 days					
OPBA	8.90	5.60	5.10	4.90	4.10	4.00
PLA	8.90	5.00	4.90	4.60	4.40	4.20
OPBA & PLA	8.90	5.40	5.00	4.70	4.30	4.10
	Strength at 7 days					
OPBA	15.00	10.00	9.00	7.10	6.30	5.70
PLA	15.00	8.50	8.40	8.20	7.90	7.40
OPBA & PLA	15.00	9.20	8.80	7.60	7.20	6.90
	Strength at 14 days					
OPBA	22.50	17.50	16.40	14.70	13.00	11.20
PLA	22.50	16.70	15.80	15.00	13.50	12.30
OPBA & PLA	22.50	17.10	16.00	14.80	13.20	11.80
	Strength at 21 days					
OPBA	23.10	20.60	20.00	17.30	15.00	12.80
PLA	23.10	19.30	18.90	18.20	15.50	13.20
OPBA & PLA	23.10	20.20	18.90	17.90	15.30	13.00

Table 2. Compressive strength of blended OPC-OPBA-PLA cement concrete at 28-90 days of curing

OPC Plus	Compressive Strength (N/mm^2) for					
	0% Poz.	5% Poz.	10% Poz.	15% Poz.	20% Poz.	25% Poz.
	Strength at 28 days					
OPBA	24.00	23.80	22.10	20.40	18.20	16.30
PLA	24.00	24.70	23.00	21.20	19.00	17.20
OPBA & PLA	24.00	24.30	22.60	20.70	18.50	16.90
	Strength at 50 days					
OPBA	24.50	25.20	24.40	22.60	20.50	19.30
PLA	24.50	26.00	25.20	23.10	21.20	20.00
OPBA & PLA	24.50	25.70	24.80	23.00	20.90	19.60
	Strength at 90 days					
OPBA	24.60	26.70	25.80	25.00	23.40	21.80
PLA	24.60	27.30	26.20	25.30	24.00	23.00
OPBA & PLA	24.60	27.00	25.90	25.10	23.60	22.10

It can be seen in tables 1 and 2 that 100% OPC concrete (the control) strength increased steadily till the age of about 28 days, after which it increased only gradually until the age of about 90 days. Table 1 shows the low strength of OPC-OPBA-PLA ternary blended cement concrete relative to the strength of the control concrete at early ages of 3 to 21 days, especially at 3-14 days. The poor early strength gets more pronounced with increase in percentage replacement of OPC with OPBA-PLA combination as shown in table 2. This very low early strength could be due to the fact that pozzolanic reaction was not yet appreciable at early ages. The pozzolanic reaction set in after some days and increased with days of curing/hydration such that the strength of blended cement concrete increased more and more with age than that of the control. Table 1 clearly shows that very high strength could be achieved for OPC-OPBA-PLA ternary blended cement concrete with 10 to 15% replacement of OPC with pozzolans at 50 to 90 days of curing.

Tables 1 and 2 also show that the strength values of OPC-OPBA binary blended cement concrete are higher than those of OPC-PLA binary blended cement concrete with5-10% OPC replacement at 3-21 days of hydration. Compressive strength values of OPC-PLA binary blended cement concretegets higher than those of OPC-OPBA binary blended cement concrete with15-25% OPC replacement at 3-21 days and at 28-90 days for all percentage replacements of OPC with pozzolan. The higher strength of OPC-OPBA binary blended cement concrete relative to that of OPC-PLA binary blended cement concreteat the earlier days of hydration shows that the pozzolanic reaction with OPBA sets in faster than that with PLA. Also, the fact that the strength of OPC-PLA binary blended cement concretegets higher than that of OPC-OPBA binary blended cement concrete at later days of hydration would suggest that PLA contains more quantity of non-amorphous silica than does OPBA. The strength value of OPC-OPBA-PLA ternary blended cement concrete consistently lies in-between the values for OPC-OPBA and OPC-PLA binary blended cement concretes for all percentage replacements and curing ages. This suggests that a disproportionate blending of the two pozzolans should be in favour of OPBA for optimization of the early strength of OPC-OPBA-PLA ternary blended cement concrete and in favour of PLA if the later strength of OPC-OPBA-PLA ternary blended cement concrete is of greater importance.

IV. CONCLUSIONS

Ternary blended cement concrete produced from blending OPC with equal proportions of OPBA and PLA have compressive strength values in between those of binary blended OPC-OPBA and OPC-PLA cement concretes for all percentage replacements of OPC with pozzolansand at all curing ages. Also, the variation of strength for OPC-OPBA-PLA ternary blended cement concrete is similar to those of OPC-OPBA and OPC-PLA binary blended cement concretes for all percentage replacements and curing ages. More importantly,the 90-day strengths of OPC-OPBA and OPC-PLAbinary blended cement concrete as well as that of OPC-OPBA-PLA ternary blended cement concrete are all higher than the control values for 5-15% replacement of OPC with pozzolans and close to the control values for 20-25% replacement. The implication of this is that very high strength values of OPC-OPBA and OPC-PLA binary blended cement concrete as well as OPC-OPBA-PLA ternary blended cement concrete could be obtained if high target strength is intentionally designed for and good quality control is applied such as the quality control measures used in producing 100% OPC (control) concrete with high strength values. Thus, OPC-OPBA-PLA ternary blended cement concrete could be used for various civil engineering and building works, especially where early strength is not a major requirement.

REFERENCES

[1.] Adewuyi, A.P., & Ola, B. F. (2005). Application of waterworks sludge as partial replacement for cement in concrete production. Science Focus Journal, 10(1): 123-130.

[2.] Agbede, I. O., &Obam, S. O. (2008). Compressive Strength of Rice Husk Ash-Cement Sandcrete Blocks.Global Journal of Engineering Research, Vol. 7 (1), pp. 43-46.

[3.] Bakar, B. H. A., Putrajaya, R. C., &Abdulaziz, H. (2010).Malaysian Saw dust ash – Improving the Durability and Corrosion Resistance of Concrete: Pre-review. Concrete Research Letters, 1 (1): 6-13, March 2010.

[4.] Cisse, I. K., &Laquerbe, M. (2000).Mechanical characterization of sandcretes with rice husk ash additions: study applied to Senegal. Cement and Concrete Research, 30 (1): p.13– 18.

[5.] Cordeiro, G. C., Filho, R. D. T., & Fairbairn, E. D. R. (2009). Use of ultrafine saw dust ash with high-carbon content as pozzolan in high performance concrete. Materials and Structures, 42: 983–992. DOI 10.1617/s11527-008-9437-z.

[6.] De Sensale, G. R. (2006). Strength development of concrete with rice-husk ash.Cement &Concrete Composites, 28: 158–160.

[7.] Dwivedia, V. N., Singh, N. P., Das, S. S., & Singh, N. B. (2006). A new pozzolanicmaterial for cement industry: Bamboo leaf ash. International Journal of Physical Sciences, 1 (3): 106-111.

[8.] Elinwa, A. U., &Abdulkadir, S. (2011). Characterizing Sawdust-ash for Use as an Inhibitor for Reinforcement Corrosion. New Clues in Sciences, 1: 1-10.

[9.] Elinwa, A. U., &Awari, A. (2001).Groundnut husk ash concrete.Nigerian Journal of Engineering Management, 2 (1), 8 - 15.

[10.] Elinwa, A. U., Ejeh, S. P., &Akpabio, I. O. (2005). Using metakaolin to improve sawdust-ash concrete. Concrete International, 27 (11), 49 - 52.

[11.] Elinwa, A. U., Ejeh, S. P., &Mamuda, M. A. (2008). Assessing of the fresh concrete properties of self-compacting concrete containing sawdust ash. Construction and Building Materials Journal, 22: 1178 - 1182.

[12.] Fadzil, A. M., Azmi, M. J. M., Hisyam, A. B. B., &Azizi, M. A. K. (2008). Engineering Properties of Ternary Blended Cement Containing Rice Husk Ash and Fly Ash as Partial Cement Replacement Materials.ICCBT, A (10): 125 – 134.

[13.] Frı´as, M., Villar-Cocin˜a, E., Sa´nchez-de-Rojas, M. I., & Valencia-Morales, E. (2005). The effect that different pozzolanic activity methods has on the kinetic constants of the pozzolanic reaction in sugar cane straw-clay ash/lime systems: Application of a kinetic–diffusive model. Cement and Concrete Research, 35: 2137 – 2142.

[14.] Habeeb, G. A., &Fayyadh, M. M. (2009).Saw dust ash Concrete: the Effect of SDA Average Particle Size on Mechanical Properties and Drying Shrinkage.Australian Journal of Basic and Applied Sciences, 3(3): 1616-1622.

[15.] Malhotra, V. M., & Mehta, P. K. (2004).Pozzolanic and Cementitious Materials. London: Taylor & Francis.

[16.] Mehta, P. K. &Pirtz, D. (2000). Use of rice husk ash to reduce temperature in high strength mass concrete. ACI Journal Proceedings, 75:60-63.

[17.] Rukzon, S., &Chindaprasirt, P. (2006). Strength of ternary blended cement mortar containing Portland cement, rice husk ash and fly ash.J. Eng. Inst. Thailand, 17: 33-38 (547-551).

[18.] Rukzon, S., Chindaprasirt, P., &Mahachai, R. (2009).Effect of grinding on chemical and physical properties of saw dust ash. International Journal of Minerals, Metallurgy and Materials, 16 (2): 242-247.

[19.] Sakr, K. (2006). Effects of Silica Fume and Rice Husk Ash on the Properties of Heavy Weight Concrete.Journal of Materials in Civil Engineering, 18(3): 367-376.

[20.] Saraswathy, V., & Song, H. (2007).Corrosion performance of rice husk ash blended concrete. Construction and Building Materials, 21 (8): p.1779–1784.

[21.] Wada, I., Kawano, T., &Mokotomaeda, N. (2000).Strength properties of concrete incorporating highly reactive rice-husk ash. Transaction of Japan Concrete Institute, 21 (1): p. 57–62.

Ni-Based Cr Alloys and Grain Boundaries Characterization

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ABSTRACT:
Three Ni-base alloys Hastelloy C22, Inconel 600, and Inconel 601 with carbon contents of 0.003, 0.05, and 0.3 wt. % respectively were used to investigate the effect of carbon on the morphology grain boundaries at constant heat treatment. From microstructural characterization and analysis, it was observed that the lowest carbon content resulted in planer character grain boundaries, the carbon content produced wavy grain boundaries and the highest carbon content produced saws-teeth grain boundaries. It is suggested that higher carbon contents result in the formation of occurred grain boundaries due to the formation of $M_{23}C_6$ morphology.

Keywords: *Boundary, Carbides, Grain, Hastelloy, Inconel, Morphology, Serration, Triangle*

I. INTRODUCTION

Ni-base alloys are widely used in space and marine environments due to their high strength, ductility and corrosion resistance. It is well documented that grain boundary serration occurs by the formation of precipitates along grain boundaries [1–6]. Investigators have found that, grain boundary serrations in stainless steel improve creep and fatigue properties of this alloy [5]. Furthermore, it has been found that in alloys 304 and 316 stainless steels, when grain boundaries are serrated the amount of carbides reduced and carbide precipitate shape changed from triangular to planar which has been proven to improve fatigue properties for those alloys [7]. In other studies [8,9] it was found that grain boundary serration occurs before carbides are precipitated on the grain boundaries. These studies also claim that when precipitation of carbides eventually occurs, planar carbides form along serrated boundaries while triangular carbides form along the unserrated boundaries. This contradicts previous reports that claim that grain boundary serration is due to precipitation of phases in the grain boundary serration. It has been found that the phase precipitated on grain boundaries in stainless steels are $M_{23}C_6$ type carbides [10-17]. Therefore, the main purpose of this study is to investigate the effect of carbon content on the morphology of grain boundary serration.

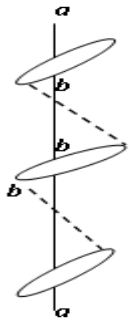

Figure 1Model shows grain boundary serration formation in stainless steel due to $M_{23}C_6$ precipitation, (a-a) grain boundary prior to formation of $M_{23}C_6$; (b-b), (c-c) serrated grain boundary after formation of $M_{23}C_6$ [10].

II. EXPERIMENTAL PROCEDURE

In order to investigate morphology of grain boundary serration in three kinds of Ni-base alloys are Hastelloy C22, Inconel 600, and Inconel 601, specimens were all solution heat treated at 1000°C for 1 hour followed by air cooling. Specimens were investigated under constant conditions using scanning electron microscopy and energy dispersive spectroscopy SEM-EDS.

Chemical compositions of the alloys are given in Table 1. To study grain boundary morphology with different carbon content, more than 5 specimens from each alloy were prepared and investigated under the same experimental conditions to confirm results.

Table 1 Nominal chemical composition of the three alloys

Chemical composition of Ni- alloys (wt.%)					
Alloy / Element	C	Fe	Mo	Cr	Ni
Haselloy C22	0.003	2.95	13.67	21.45	Bal.
Inconel 600	0.05	8.58	-	15.77	Bal.
Inconel 601	0.3	16.09	-	22.14	Bal.

Microstructural examination of Hastelloy C22 alloy (0.003%C) as shown in "Figure 2" reveals that more precipitates formed on grain boundaries. Also, the grain boundaries were essentially planar possibly because of the formation of the planer and spherical precipitates along these grain boundaries.

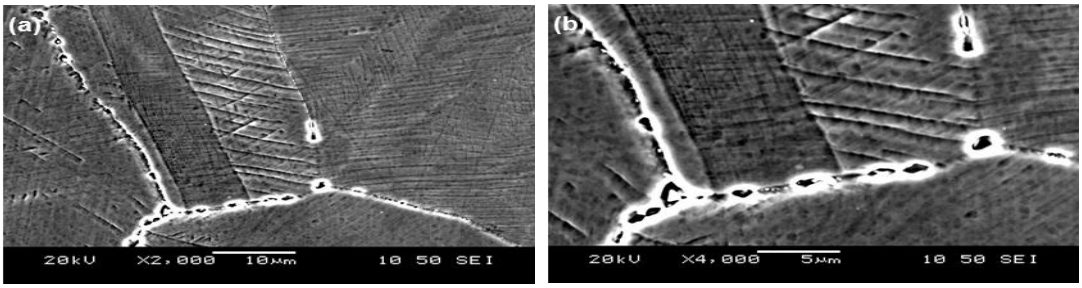

Figure 2 SEM images showing planer grain boundaries of Hastelloy C22 (a) at 2000 and (b) at 4000 magnification.

The morphology of the grain boundaries in Inconel 600 as shown in "Figure 3" is quite different from those for Hastelloy C22 as shown in "Figure 2". In Inconel alloy 600, the grain boundaries have wavy appearance possibly due to the grain boundary formation of small amount of carbides. Further in Inconel 600 the grain boundaries are more rounded morphology compared to those in Hastelloy C22.

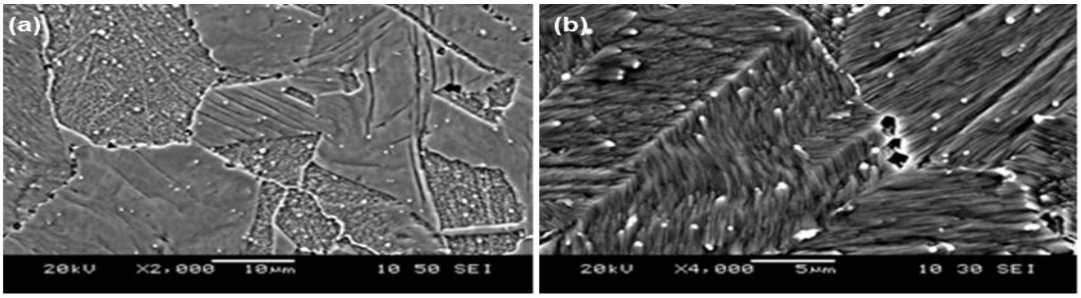

Figure 3 SEM images showing wavy grain boundaries of Inconel 600 (a) at 2000 and (b) at 4000 magnification.

In Inconel 601, it was observed that the grain boundaries are very distinct saw teeth shape like as shown in "Figure 4" and also the carbides precipitates within the grains are triangular in shape as shown in "Figure 5" and a single precipitate observed at 8000 magnification as shown in "Figure 5 b". Further it was found that the grain boundaries are more visibly serrated in Inconel 601 than in Inconel 600 or Hastelloy C22.

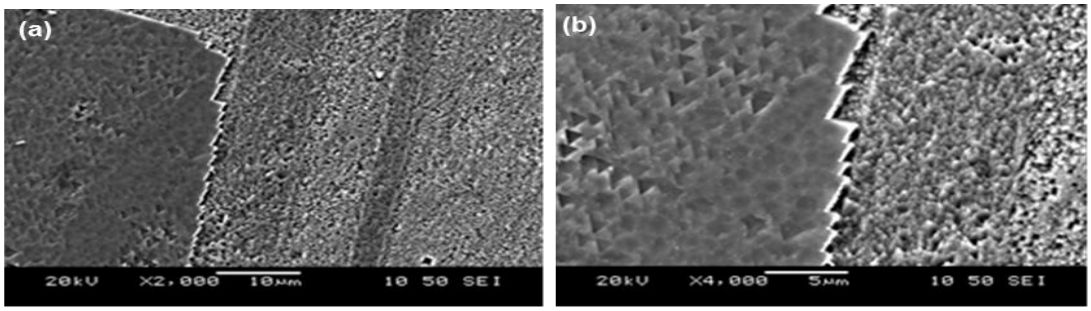

Figure 4 SEM images showing saw teeth and serrated grain boundaries of Inconel 601(a) at 2000 and (b) at 4000 magnification.

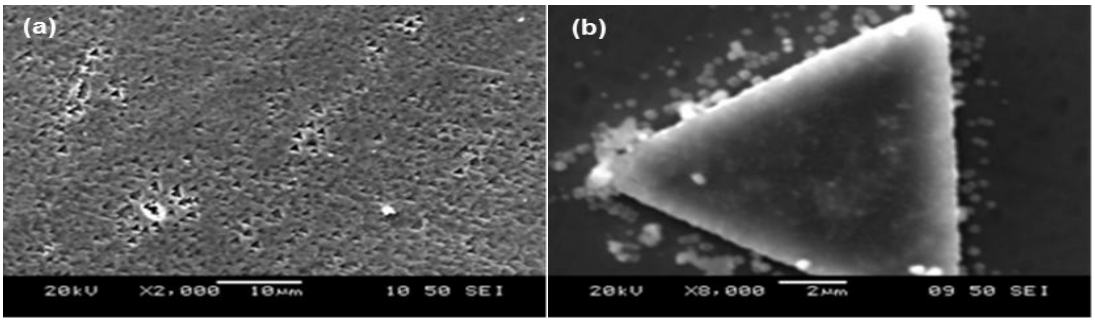

Figure 5 SEM images of triangle carbides precipitates in Inconel 601(a) at 2000 and (b) at 8000 magnification.

A major observation that Inconel 601 alloy which contains a significantly higher carbon content (C = 0.3%) showed the most visible within the grains and within grain boundaries serration. Also, Inconel 600 alloy (C = 0.05%) had more visibly serrated grain boundaries than Hastelloy C22 (C = 0.003%). Therefore, it can be concluded that the percentage of carbon composition possibly determines the morphology of the grain boundaries as well as the shape of grain boundaries precipitates. The higher the carbon content the more pronounced the grain boundary serration. Figure 6 general schematic diagram illustrate grain boundaries for the three alloys planar, wavy and saw teeth (a) Hastelloy C22 (b) Inconel 600 and (c) Inconel 601

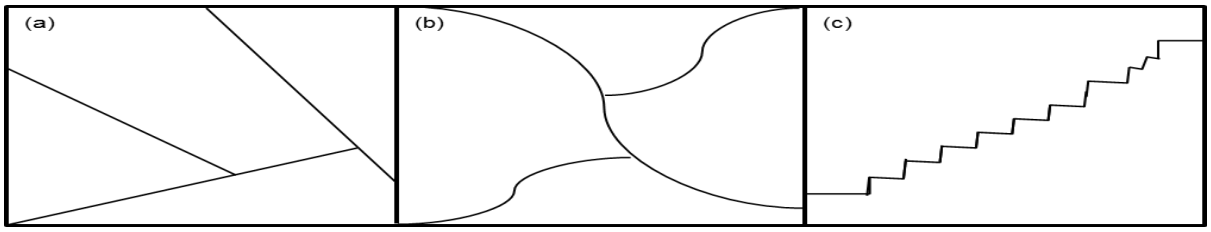

Figure 6 1Model shows grain boundaries planar serration, wavy, and saw teeth for (a) Hastelloy C22 (b) Inconel 600 and (c) Inconel 601 respectively.

Examination of the ternary Ni-Cr-Fe phase diagram [18] indicates that the major constituent phase in the three alloys considered is the γ phase. Further analysis done using computer program software JMatPro 4.0 shows that the Hastelloy C22 and Inconel 600 is the γ phase, whereas Inconel 601 show that the γ phase and M_7C_3 at temperature 1000°C for 1hour for three alloys as shown in "Figure 7".

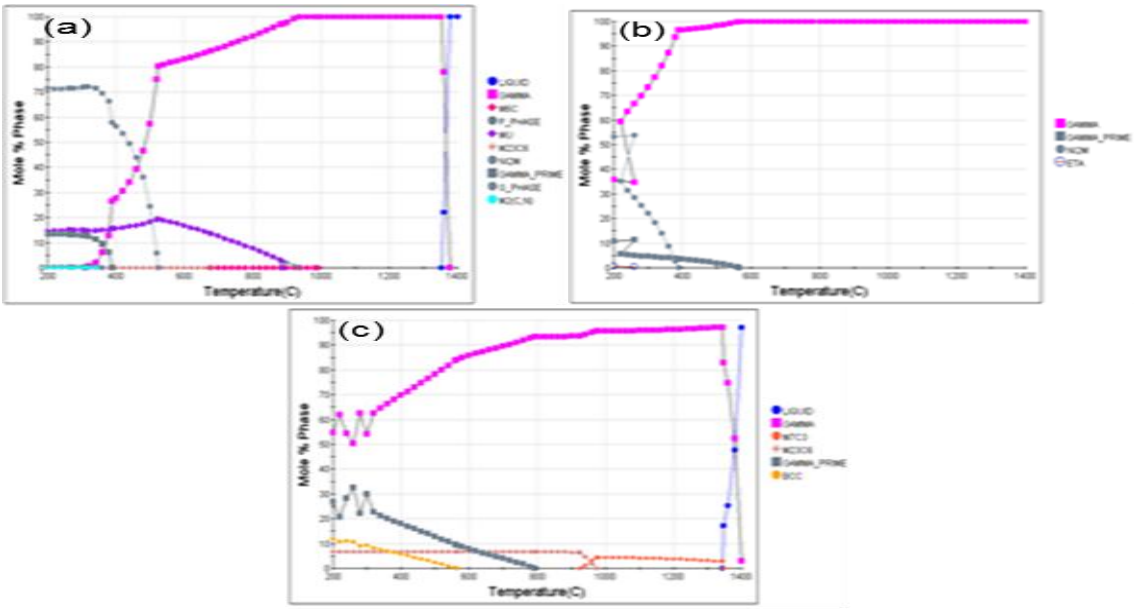

Figure 7 Show phase diagram of three Ni-base alloys solution treated at 1000°C for 1 hour followed by air cooled exhibited γ phase (a) Hastelloy C22, (b) Inconel 600 and (c) Inconel 601.

III. CONCLUSIONS

The study shows grain boundary morphology can be related to the amount of carbon present in nickel base alloys. Grain boundary serration becomes more pronounced with increasing carbon content. With increasing carbon content, grain boundary morphology changed from planar in Hastelloy C22 to serrate with rounded features in Inconel 600 alloy and to serrated with saw-teeth like appearance in Inconel 601.

REFERENCES

[1] K.J. Kim, J. Ginsztler, S.W. Nam, The Role of Carbon on the Occurrence of Grain Boundary Serration in an AISI 316 Stainless Steel during Aging Heattreatment, Materials Letters, 59:1439–1443, 2005.

[2] J.M. Larson and S. Floreen, Metallurgical Factors Affecting the Crack Growth Resistance of a Superalloy, Metallurgical Transactions A, 8: 51-53, 1977.

[3] T.M. Maccagno, A.K. Koul, J.-P. Immarigeon, L. Cutter, and R. Allem, Microstructure, Creep Properties, and Rejuvenation of Service-Exposed Alloy 713C Turbine Blades, Metallurgical Transactions A. 21: 3115-3125, 1990.

[4] M. Yamazaki and S. Hori, On the Baryon Mass Levels II, Progress of Theoretical Physics, 36:1035-1043:1966.

[5] M. Enomoto, H. Harada, M. Yamazakii , Calculation of γ'/γ Equilibrium Phase Compositions in Nickel-Base Superalloys by Cluster Variation Method, Calphad. 15:143–158, 1991.

[6] M. Tanaka, H. Iizuka, and F. Ashihara, Effects of Serrated Grain Boundaries on the Crack Growth in Austenitic Heat-Resisting Steels during high-temperature creep, Journal of Materials Science, 23:3827-3832, 1988.

[7] K.J. Kim, H. Hong, K. Min, S.W. Nam, Correlation between the Carbide Morphology and Cavity Nucleation in an Austenitic Stainless Steels under Creep-Fatigue, Materials Science and Engineering A, 387–389:531–535, 2004.

[8] K. S. Min, and S. W. Nam, Correlation between Characteristics of Grain Boundary Carbides and Creep–Fatigue Properties in AISI 321 Stainless Steel, Journal of Nuclear Materials, 322:91–97, 2003.

[9] H.U. Hong, S.W. Nam, Z. Crystallography Investigation on the Serrated Grain Boundary in an AISI 316 Stainless Steel, Journal of Nuclear Materials, 393:249–253, 2009.

[10] A.K. Koul and R. Thamburaj, Serrated Grain Boundary Formation Potential of Ni-Based Superalloys and Its Implications, Metallurgical Transactions A, 16:17-25, 1985.

[11] A.M. Donald, L.M. Brown, Grain Boundary Faceting in Cu-Bi Alloys, Acta Metallurgica, 27:59–61, 1979.

[12] T.E. Hsieh, R.W. Balluffi, Experimental Study of Grain Boundary Melting in Aluminum, Acta Metallurgica, 37:1637–1644, 1989.

[13] D.E. Luzzi, High-Resolution Electron Microscopy Observations of Faceted Grain Boundaries and Twins in Bismuth-Doped Copper, Ultramicroscopy, 37:180–181, 1991.

[14] T.G. Ference, R.W. Balluffi, Observation of a Reversible Grain Boundary Faceting Transition Induced by Changes of Composition, Technical Report, Massachusetts Inst. of Tech., Cambridge (USA), 22:1929–1930, 1988.

[15] M. Menyhard, B. Blum, C.J. McMahon, Grain Boundary Segregation and Transformations in Bi-doped Polycrystalline Copper, Acta Metallurgica, 37:549–557, 1989.

[16] J.R. Rellick, C. McMahon, H. Marcus, P. Palmberg, The Effect of Tellurium on lntergranular Cohesion in Iron, Metallurgical Transactions, 2:1492-1493, 1971.

[17] Chantal Loier and Jean-Yves Boos C. Loier, J.Y. Boos, The Influence of Grain Boundary Sulfur Concentration on the Intergranular Brittleness of Different Purities, Metallurgical Transactions A, 12:1222—1223, 1981.

[18] Donna Sue Plickert, Steve Starr, Karen Skiba, Patricia Eland, Jeff Fenstermaker, ASM Handbook, Alloy Phase Diagrams, 3:345–347, 1992.

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Comparative Study of Available Technique for Detection in Sentiment Analysis

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ABSTRACT:

Our day-to-day life has always been influenced by what people think. Ideas and opinions of others have always affected our own opinions. As the Web plays an increasingly significant role in people's social lives, it contains more and more information concerning their opinions and sentiments. The distillation of knowledge from this huge amount of unstructured information, also known as opinion mining and sentiment analysis. It has recently raised growing interest for purposes such as customer service, financial market prediction, public security monitoring, election investigation, health related quality of life measure, etc. Sentiment Analyzer (SA) that extracts sentiment (or opinion) about a subject from online text documents. Instead of classifying the sentiment of an entire document about a subject, SA detects all references to the given subject, and determines sentiment in each of the references using natural language processing (NLP) techniques. There are various machine learning algorithms that attempt to predict the sentiment or opinions of some documents or information of particular data and organize data, such as finding positive and negative reviews while diminishing the need for human effort to classify the information. This paper compares the NLP and machine learning methods of sentiment analysis and determines which one is better.

Keywords: *Sentiment Analyzer, Natural Language Processing, Machine Learning.*

I. INTRODUCTION

A vital part of the information era has been to find out the opinions of other people. In the pre-web era, it was customary for an individual to ask his or her friends and relatives for opinions before making a decision. Organizations conducted opinion polls, surveys to understand the sentiment and opinion of the general public towards its products or services. In the past few years, web documents are receiving great attention as a new medium that describes individual experiences and opinions. With explosion of Web 2.0 [1] applications such as blogs, forums and social networks came. The rise of blogs and social networks has fueled a market in personal opinion, reviews, ratings, recommendations and other forms of online expression. For computer scientists, this fast-growing mountain of data is opening a tantalizing window onto the collective consciousness of Internet users. An emerging field known as sentiment analysis is taking shape around one of the computer world's unexplored frontiers, translating the vagaries of human emotion into hard data. This is more than just an interesting programming exercise. For many businesses, online opinion has turned into a kind of virtual currency that can make or break a product in the marketplace. Therefore organizations have evolved and now look at review sites to know the public opinion about their products instead of conducting surveys. However, gathering all this online information manually is time consuming. Therefore automatic sentiment analysis is important. To do so, the main task is to extract the opinions, facts and sentiments expressed in these reviews. Sentiment analyzer that extracts sentiment about a given topic using NLP techniques consists of 1) a topic specific feature term extraction, 2) sentiment extraction, and 3) (subject, sentiment) association by relationship analysis. SA utilizes two linguistic resources for the analysis: the sentiment lexicon and the sentiment pattern database.

Using machine learning algorithm for sentiment analysis is to extract human emotions from text or documents. Metrics such as accuracy of prediction and precision/recall are presented to gauge the success of these different algorithms. A system is there to process the documents and to predict human reactions, as well as provide results.

II. LITERATURE SURVEY

Sentiment Analysis is the computational study of opinions, sentiments and emotions expressed in text. Lui [2] mathematically represented an opinion as a quintuple (o, f, so, h, t), where o is an object; f is a feature of the object o; so is the polarity of the opinion on feature of object o; h is an opinion holder; t is the time when the opinion is expressed. The goal of sentiment analysis is to detect subjective information contained in various sources and determine the mind-set of an author towards a text or document. The research field of sentiment analysis is rapid in progress due to the rich and diverse data provided by Web 2.0 applications. Blogs, review sites, forums, micro blogging sites, wikis and social networks are all the sources used for sentiment analysis. Today, a huge amount of information is available from this application of Web 2.0, among these types of information available, one useful type is the sentiment, or opinions people express towards a subject that *is* either a topic of interest or a feature of the topic .There has been extensive research on automatic text analysis for sentiment, such as sentiment classifiers [3], affect analysis, automatic survey analysis, opinion extraction [4], or recommender systems. These methods typically try to extract the overall sentiment revealed in a document, positive, negative or neutral .Two challenging aspects of sentiment analysis are: First, although the overall opinion about a topic is useful, it is only a part of the information of interest. Document level sentiment classification fails to detect sentiment about individual aspects of the topic. In reality, for example, though one could be generally happy about his car, he might be dissatisfied by the engine noise. To the manufacturers, these individual weaknesses and strengths are equally important to know, or even more valuable than the overall satisfaction level of customers. Second, the association of the extracted sentiment to a specific topic is difficult. Most statistical opinion extraction algorithms show some shortcomings and hence developed sentiment Analyzer (SA) that extracts topic-specific features, extracts sentiment of each sentiment-bearing phrase, makes (topic| feature), sentiment association.

The machine learning approach applicable to sentiment analysis mostly belongs to supervised classification in general and text classification techniques in particular. Thus, it is called "supervised learning". In a machine learning based classification, two sets of documents are required: training and a test set. A training set is used by an automatic classifier to learn the differentiating characteristics of documents, and a test set is used to validate the performance of the automatic classifier. A number of machine learning techniques have been adopted to classify the reviews like Naive Bayes (NB), maximum entropy (ME), and support vector machines (SVM) have achieved great success in text categorization.

III. SENTIMENT ANALYSIS METHODS

A. Natural Language Processing Approach

In the natural language processing method of sentiment analysis this paper extract the opinion or sentiment by using sentiment analyzer [5] that includes feature term extraction a feature term of a topic is a term that satisfies one of the following relationships:

a) a part-of relationship with the given topic

b) an attribute-of relationship with the given topic.

c) an attribute-of relationship with a known feature of the given topic.

There are two linguistic resources used by sentiment analysis sentiment lexicon and sentiment pattern database. The sentiment lexicon contains the sentiment definition of individual words in the following form:
<lexical_entry> <POS> <sent_category>
Lexical_entry is a (possibly multi-word) term that has sentimental connotation, POS is the required POS tag of lexical entry, sentiment_category: + | -
The following is an example of the lexicon entry:
"Excellent" JJ +.
Sentiment pattern database contains sentiment extraction patterns for sentence predicates. The database entry is defined in the following form:
<predicate> <sent_category> <target>
predicate: typically a verb, sent_category: + | - | [˜] source is a sentence component (SP|OP|CP|PP) whose sentiment is transferred to the target. SP, OP, CP, and PP represent subject, object, complement (or adjective), and prepositional phrases, respectively. The opposite sentiment polarity of source is assigned to the target, if ˜ is specified in front of source target is a sentence component (SP|OP|PP) the sentiment is directed to. As a preprocessing step to sentiment analysis, we extract sentences from input documents containing mentions of subject terms of interest. After parsing each input sentence by a syntactic parser, SA identifies sentiment phrases from subject, object, adjective, and prepositional phrases of the sentence. Within the phrase, we identify

all sentiment adjectives defined in the sentiment lexicon. For example, vibrant is positive sentiment phrase for the sentence

"The colors are vibrant."

Extract all base noun consist of at least one sentiment word. The sentiment of the phrase is determined by the sentiment words in the phrase. For example, excellent pictures are a positive sentiment phrase because excellent is a positive sentiment word. For a sentiment phrase with a word with negative meaning, such as not, no, never, hardly, seldom, or little, the polarity of the sentiment is reversed. SA extracts T- and B-expressions in order to make (subject, sentiment) association. From a T-expression, sentiment of the verb (for sentiment verbs) or source (for trans verb), and from a B-expression, sentiment of the adjective, is assigned to the target.

B. Machine Learning approach

For machine learning there is a system [6] consisted of first processing the confessions in order to extract a feature set, before passing the data into a supervised learning algorithm.

1) Parser Method: In order to refine our data and improve the feature set, we removed all HTML tags using a Python parser. This was essential towards refining our dataset because HTML tags do not convey emotions and would skew our feature vector by including phrases that have no semantic meaning (e.g. ' ;'). Emoticons, on the other hand, are an excellent way of conveying emotions through text because it captures the emotion of the writer by including a facial expression. Therefore; we captured this unique feature set and used it to improve our feature vector.

2) Spell Checking: There are many spelling errors. In order to reduce problems of over fitting as a result of having too many unique spellings, rather than raw data through a spell checker and corrected all the spelling errors.

3) *Features:* In this paper, there are three features considered: bag of words, WordNet2 synsets, and sentiment lexicons.

3.1) Bag of Words (BoW): It treats each unique word token as a separate feature.

3.2) *Word Net Synsets:* In order to further improve the quality of the feature set and decrease over fitting, we used WordNet to map the words in the confessions onto their synonym set (synset).

3.3) *Sentiment Lexicons:* Sentiment lexicons are groupings of words into emotion.

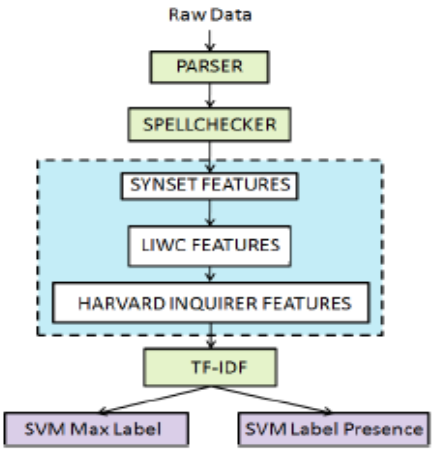

Fig. 1 Model Diagram.

4) TF-IDF: Function words such as 'and', 'the', 'he', 'she' occur very often across all confessions. Therefore, it makes little sense to put a lot of weight on such words when using bag of words to classify the documents. One common approach is to remove all words found in a list of high frequency stop words. A better approach is to consider each word's Term Frequency-Inverse Document Frequency (TF-IDF) weight. The intuition is that a frequent word that appears in only a few confessions conveys a lot of information, while an infrequent word that appears in many confessions conveys very little information.

IV. THEORETICAL ANALYSIS

From our initial experience with sentiment detection, we have identified a few areas of potentially substantial improvements. We expect full parsing will provide better sentence structure analysis, thus better relationship analysis. Second, more advanced sentiment patterns currently require a fair amount of manual validation. Although some amount of human expert involvement may be in-evitable in the validation to handle the semantics accurately, we plan on more research on increasing the level of automation systems understand and manipulate natural languages to perform the desired tasks.

At the core of any NLP task there is the important issue of natural language understanding. The process of building computer programs that understand natural language involves three major problems: the first one relates to the thought process, the second one to the representation and meaning of the linguistic input, and the third one to the world knowledge. Thus, an NLP system may begin at the word level to determine the morphological structure, nature (such as part-of-speech, meaning) etc. of the word – and then may move on to the sentence level – to determine the word order, grammar, meaning of the entire sentence, etc. Then to the context and the overall environment or domain. A given word or a sentence may have a specific meaning or connotation in a given context or domain, and may be related to many other words and/or sentences in the given context.

In machine learning, the broad field of Artificial Intelligence, which aims to mimic intelligent abilities of humans by machines. In the field of Machine Learning [6] one considers the important question of how to make machines able to "learn". Learning in this context is understood as inductive inference, where one observes examples that represent incomplete information about some "statistical phenomenon". In unsupervised learning one typically tries to uncover hidden regularities (e.g. clusters) or to detect anomalies in the data (for instance some unusual machine function or a network intrusion). In supervised learning, there is a label associated with each example. It is supposed to be the answer to a question about the example. Based on these examples (including the labels), one is particularly interested to predict the answer for other cases before they are explicitly observed. Hence, learning is not only a question of remembering but also of generalization to unseen cases.

V. COMPARATIVE STUDY

In this paper there is a comparative study between NLP and ML approach. There are several parameters [7] considered:

A. *Keyword Selection*

Topic based classification usually uses a set of keywords to classify texts in different classes. In sentiment analysis we have to classify the text in to two classes (positive and negative) which are so different from each other. But coming up with a right set of keyword is not a petty task. This is because sentiment can often be expressed in a delicate manner making it tricky to be identified when a term in a sentence or document is considered in isolation.

B. *Sentiment is Domain Specific*

Sentiment is domain specific and the meaning of words changes depending on the context they are used in. Consider an example: go read the book

The example has a positive sentiment in the book domain but a negative sentiment in the movie domain, it suggests that the book is preferred over the movie, and thus have an opposite result [8].

C. *Multiple Opinions in a Sentence*

Single sentence can contain multiple opinions along with subjective and factual portions. It is helpful to isolate such clauses. It is also important to estimate the strength of opinions in these clauses so that we can find the overall sentiment in the sentence, e.g.: The picture quality of this camera is amazing and so is the battery life, but the viewfinder is too small for such a great camera‖. It expresses both positive and negative opinions [8].

D. Negation Handling

Handling negation can be tricky in sentiment analysis. For example:

I like this dress‖ and I don't like this dress‖

These sentences differ from each other by only one token but consequently are to be assigned to different and opposite classes. Negation words are called polarity reversers.

Parameter of Sentiment Analysis	NLP Approach	ML Approach
Keyword Selection	Not Efficient.	Most Effective.
Sentiment is Domain Specific	Efficient to check grammar in specific sentiment statement.	Not more effective and require specific training to statement.
Multiple Opinions in a Sentence	Not efficient for frequently changing opinion.	Efficient for differ opinion statement by using ML agent.
Negation Handling	More efficient for negation statement.	Equally Efficient for negation statement.

Table I Comparative Study Of Nlp And Ml Approach.

In this paper , two different approaches are considered and compared with the help of different parameters so from this table it can be noticed that NLP approach is much efficient in keyword selection **,** efficient to check grammar in specific sentiment statement , not efficient for frequently changing opinion , more efficient for negation statement and for ML approach it has noticed that it is more efficient in keyword selection, not more effective in domain specific sentiment and require specific training to statement, efficient for differ opinion statement by using ML agent and equally efficient for negation statement. So therefore if there is combination of two approaches then analysis of sentiment will be more effective.

VI. CONCLUSION

Sentiment Analyzer (SA) consistently demonstrated high quality results of for the general web pages. Although some amount of human expert involvement may be inevitable in the validation to handle the semantics accurately, plan on more research on increasing the level of automation. Nonetheless, the synset and sentiment lexicons, used are better suited to more formal styles of writing. An alternative approach is to replace our synsets and lexicons with "slang" versions or even the automatic generation of sentiment lexicons on a slang corpus. Another area of interest is the difficulty in correlating topics with sentiment. Intuition says that topics themselves should portray different sentiments, and so should be useful for sentiment analysis. This method turns out to be fairly crude, as sometimes topics may be too neutral or too general. Thus, it is concluded that hybrid approach that is combination of NLP and ML approach can strengthen analysis of sentiment or opinions on different parameters and can give a better result than applying individual approach .

REFERENCES

[1] Tim O'Reilly, Web 2.0 Compact Definition: Trying Again (O'Reilly Media, Sebastopol), http://radar.oreilly.com/archives/2006/12/web_20_compact.html. Accessed 22 Mar 2007

[2] Liu B. Sentiment Analysis and Subjectivity. Handbook of Natural Language Processing, Second edition, 2010

[3] B. Pang, L. Lee, and S. Vaithyanathan. Thumbs up? Sentiment classification using machine learning techniques. *In Proc. of the 2002 ACL EMNLP Conf., pages 79–86, 2002.*

[4] S. Morinaga, K. Yamanishi, K. Teteishi, and T. Fukushima. Mining product reputations on the web. *In Proc. of the 8th ACM SIGKDD Conf., 2002.*

[5] Jeonghee Yi, Tetsuya Nasukawa, Razvan Bunescu, Wayne Niblack,*"Sentiment Analyzer: Extracting Sentiments about a Given Topic using Natural Language Processing Techniques",* Proceedings of the Third IEEE International Conference on Data Mining ,2003 .

[6] Raymond Hsu, Bozhi See, Alan Wu,*"Machine Learning for Sentiment Analysis on the Experience Project",* 2010.

[7] Akshi Kumar ,Teeja Mary Sebastian, Sentiment Analysis: "*A Perspective on its Past, Present and Future",*2012 .

[8] Pang, B and Lee L. Opinion mining and sentiment analysis. Foundations and Trends in Information Retrieva, l 2008, (1-2), 1–135

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Analyzing massive machine data maintaining in a cloud computing

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ABSTRACT:

We present a novel framework, Cloud View, for storage, processing and analysis of massive machine maintenance data, collected from a large number of sensors embedded in industrial machines, in a cloud computing environment. This paper describes the architecture, design, and implementation of CloudView, and how the proposed framework leverages the parallel computing capability of a computing cloud based on a large-scale distributed batch processing infrastructure that is built of commodity hardware. A case-based reasoning (CBR) approach is adopted for machine fault prediction, where the past cases of failure from a large number of machines are collected in a cloud. A case-base of past cases of failure is created using the global information obtained from a large number of machines. Case-base creation jobs are formulated using the MapReduce parallel data processing model. CloudView captures the failure cases across a large number of machines and shares the failure information with a number of local nodes in the form of case-base updates that occur in a time scale of every few hours. The case-base is updated regularly (in the time scale of a few hours) on the cloud to include new cases of failure, and these case-base updates are pushed from CloudView to the local nodes. Our approach, in addition to being the first reported use of the cloud architecture for maintenance data storage, processing and analysis, also evaluates several possible cloud-based architectures that leverage the advantages of the parallel computing capabilities of the cloud to make local decisions with global information efficiently, while avoiding potential data bottlenecks that can occur in getting the maintenance data in and out of the cloud.

Keywords: *Fault prediction, machine data analysis, case-based reasoning, cloud computing,*

I. INTRODUCTION:

Modern complex industrial machines and systems have thousands of sensors that gather maintenance data continuously for condition monitoring and failure prediction purposes. In systems such as power grids, real-time information is collected using specialized electrical sensors called Phasor Measurement Units (PMU) at the substations. The information received from PMUs must be monitored in real time for estimating the state of the system and for predicting failures.

CBR is a method that finds solutions to new problems based on past experience. This past experience is organized and represented as cases in a case base. The processes involved in CBR are

1. Retrieving similar cases from case base,
2. Reusing the information in the retrieved cases,
3. Revising the solution, and
4. Retaining a new experience into the case base.

CBR systems utilize incremental learning in which new cases are added into the case base with time. The major contributions of this paper are: 1) We propose for the first time, "CloudView," a framework for machine data organization and analysis in a computing cloud, that allows efficient collection of machine sensor and fault data and creation of case libraries that capture a global knowledge of machine failures, 2) A hybrid approach for machine data analysis and fault prediction which includes a cloud for massive data organization and analysis and local nodes for real-time fault prediction, thus avoiding data communication bottlenecks present in typical cloud architectures. Instead of proposing new algorithms for case-based data analysis (which is an established area of research within computer sciences and engineering), our effort behind the proposed hybrid approach and the CloudView framework is aimed at supporting a wide variety of data analysis algorithms within cloud architecture and providing support through experimental results.

II. PROPOSED FRAMEWORK

CloudView is based on Hadoop which is a framework for running applications on large clusters built of commodity hardware. Hadoop comprises of two major components:

1. HDFS: HDFS stores files across a collection of nodes in a cluster. Large files are split into blocks and each block is written to multiple nodes (default is three) for fault tolerance.
2. MapReduce: MapReduce is a parallel data processing model which has two phases: Map and Reduce. In the Map phase, data are read from a distributed file system (such as HDFS), partitioned among a set of computing nodes in the cluster, and sent to the nodes as a set of key-value pairs. The Map tasks process the input records independent of each other and produce intermediate results as key-value pairs. The intermediate results are stored on the local disk of the node running the Map task. When all the Map tasks are completed, the Reduce phase begins in which the intermediate data with the same key is aggregated. An optional Combine task can be used to perform data aggregation on the intermediate data of the same key for the output of the mapper before transferring the output to the Reduce task.

III. MODULES OF CLOUD VIEW

A. Data collectors

It collects the streaming time-series data from the sensors embedded in industrial machines. Each incoming data stream is mapped to one of the Data Collector nodes. Each Data collector node has a Data Aggregator, Data Filter, and Data Archiver module.The Data Collectors buffer preprocess and filter the streaming data into larger chunks and stores it in HDFS Data Collectors use Hadoop's SequenceFile class which provides a persistent data structure and serves as a container for multiple records.

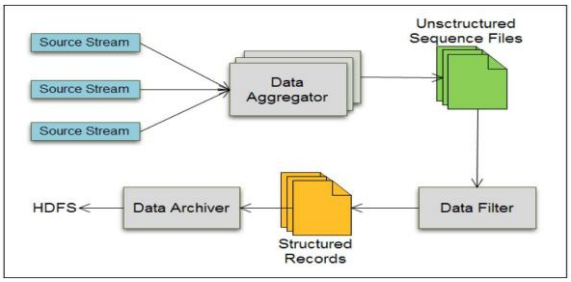

Fig. 1 Data flow in a Data Collector node which forms a part of the CloudView framework.

As shown in fig 1.The streaming data from the machines are in the form of records where each record is a single line of text. The Data Aggregator aggregates streams of sensor data into Unstructured-SequenceFiles on the local disk of the Data Collector node. The Data Aggregator writes the records of input data streams as key-value pairs in SequenceFiles, where key is just a sequence number. The Data Filter converts the Unstructured-SequenceFiles into structured records by parsing the records (lines) in Unstructured-SequenceFiles and extracting the sensor readings. The Data Filter also filters out bad records in which some sensor readings are missing. The Data Archiver moves the Structured Records to HDFS.

B. Case-base creation module

A CBR is adopted for machine fault prediction, where the past cases of failure from a large number of machines are collected in a cloud.Create case bases from the legacy data in databases at the initial stage and to automatically collect new cases at the online runtime stage in CBR systems.Legacy databases are maintained by Diagnostics Centers for machines. It has data on the past faults in the machines, and the Machine Sensor Database has the time stamped sensor data. Case-Base creation proceeds by retrieval of information on past faults in a machine from the Maintenance Database, and then the sensor data in a small time window before the fault from the Machine Sensor Database.

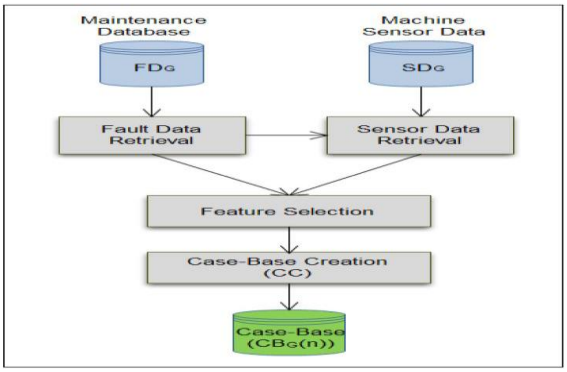

Fig. 2. Creation of case base from the machine data collected in the cloud.

Fig. 2 shows the steps involved in Case-Base creation (CC task). For creating the Case Base we propose using the machine data in the legacy databases as well as the machine sensor (SDG) and faults data (FDG) which is collected in HDFS. Such legacy databases are typically maintained by the Maintenance and Diagnostics Centers for machines. The Machine Maintenance Database has data on the past faults in the machines, and the Machine Sensor Database has the time stamped sensor data. To leverage the parallel computing capability of Hadoop for Case-Base creation, we propose automated migration of the data in the legacy Machine Maintenance and Machine Sensor databases to HDFS. This allows formulation of fault data and sensor data retrieval tasks as MapReduce jobs.

C. Map reduce job

Cloud View is based on Hadoop which is a framework for running applications on large clusters built of commodity hardware. Hadoop comprises of two major components:

1. HDFS: HDFS stores files across a collection of nodes in a cluster. Large files are split into blocks and each block is written to multiple nodes (default is three) for fault tolerance.
2. MapReduce: MapReduce is a parallel data processing model which has two phases: Map and Reduce. In the Map phase, data are read from a distributed file system (such as HDFS), partitioned among a set of computing nodes in the cluster, and sent to the nodes as a set of key-value pairs. The Map tasks process the input records independent of each other and produce intermediate results as key-value pairs. The intermediate results are stored on the local disk of the node running the Map task. When all the Map tasks are completed, the Reduce phase begins in which the intermediate data with the same key is aggregated. An optional Combine task can be used to perform data aggregation on the intermediate data of the same key for the output of the mapper before transferring the output to the Reduce task.

D. Case-Base Updating Module

The case-base updating module sends updates of case base to the local nodes when new cases are added to the casebase. In push-based updation approach, the local nodes can also pull the recent case base from CloudView.CloudView captures the failure cases across a large number of machines and shares the failure information with a number of local nodes in the form of case-base updates that occur in a time scale of every few hours.The case-base is updated regularly on the cloud to include new cases of failure, and these case-base updates are pushed from CloudView to the local nodes.

E. Case-Base Maintenance Module

In Case-Base Maintenance module , adds new cases into the case base, detects and removes redundant and inconsistent cases in the case base. Addition of new cases to the case base is done by incorporating the new faults and sensor data which are collected from machines in HDFS, into the case base. Avoiding potential data bottlenecks that can occur in getting the maintenance data in and out of the cloud. In this approach each case is classified according to its competence into four categories,

3. Pivotal cases, that are the only case that can solve a target problem,
4. Auxiliary cases, that are the cases which are completely subsumed by other cases in the case base,
5. Spanning cases, that link together areas which are independently covered by other cases, and
6. Support cases, that exist in groups and solve similar target problems as other cases in a group.

IV. LOCAL NODES

Local nodes are present in each plant or turbine farm and are connected to CloudView. Each local node maintains a local copy of the case base which is created in CloudView from the faults and sensor data of a large number of machines.

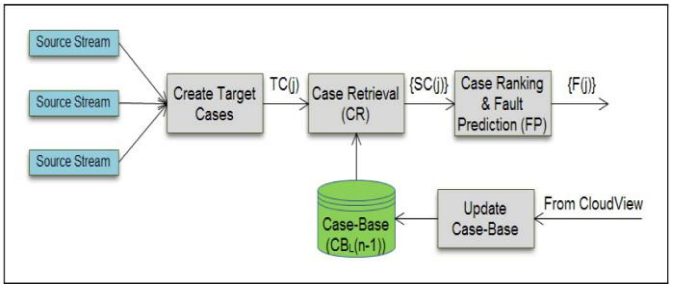

Fig. 3.Case-based reasoning at the local node in the proposed hybrid approach to predict incipient failure

The functions of the local node are as follows:

1. Target Case Creation. To match the real-time data to the cases in the case-base, target cases (TC) are created from the real-time data.Target case creation involves parsing the sensor data stream into different sensor readings. The information from the machine profiles is used to identify the different fields in the sensor data streams for parsing the streams.
2. Case Retrieval. Case Retrieval (CR) module retrieves all the cases from the local case base that are similar to the target case. The Case Retrieval module uses a similarity degree for matching the target case to the past cases.
3. Case Ranking and Fault Prediction. The Case Ranking & Fault Prediction (FP) Module ranks the cases retrieved by the Case Retrieval module according to a degree of similarity to the target case. Each retrieved case has a fault type associated with it.The output of this module is a set of cases (F) ranked according to the similarity to the target case from which the incipient faults are determined.

V. CONCLUSION

Case-based reasoning (CBR) puts forward a paradigmatic way to attack AI issues, namely problem solving, learning, usage of general and specific knowledge, combining different reasoning methods, etc. CBR emphasizes problem solving and learning as two sides of the same coin: problem solving uses the results of past learning episodes while problem solving provides the backbone of the experience from which learning advances. Particularly in its many activities related to integration of CBR and other approaches and by its movement toward the development of application-oriented CBR systems.

VI. VI.ACKNOWLEDGMENTS

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REFERENCES

[1] R.R. Hill, J.A. Stinebaugh, D. Briand, A.S. Benjamin Dr., and J. Linsday, "Wind Turbine Reliability: A Database and Analysis Approach," Sandia Report, Feb. 2008.
[2] S. Baumik, "Failure of Turbine Rotor Blisk of an Aircraft Engine,"Eng. Failure Analysis, vol. 9, pp. 287-301, 2002.
[3] F.J.G. Carazas and G.F.M. de Souza, "Availability Analysis of Gas Turbines Used in Power Plants," Int'l J. Thermodynamics, vol. 12,no. 1, pp. 28-37, Mar. 2009.
[4] J. Kolodner, Case-Based Reasoning. Morgan Kaufmann, 1993.
[5] K.Kalpakis and S. Tang, "Collaborative Data Gathering in Wireless Sensor Networks Using Measurement Co-Occurrence," Computer Comm., vol. 31, no. 10, pp. 1979-1992, June 2008.
[6] S.G. Lee and Y.C. Ng, "Hybrid Case-Based Reasoning for On-Line Product Fault Diagnosis," Int'l J. Advance Manufacturing Technology, vol. 27, pp. 833-840, 2005.
[7] B. Smyth and P. Cunningham, "The Utility Problem Analysed—A Case-Based Reasoning Perspective," Proc. Third European Workshop Case-Based Reasoning (EWCBR), 2000.
[8] J. Zhu and Q. Yang, "Remembering to Add: Competence Persevering Case-Addition Policy for Case-Base Maintenance," Proc. 16th Int'l Joint Conf. AI, pp. 234-239, 2002.

Implementation of an Algorithmic To Improve MCDS Based Routing In Mobile Ad-Hoc Network By Using Articulation Point

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ABSTRACT
A virtual backbone can reduce the Communication Overhead, increase the Bandwidth Efficiency, reduce Channel Bandwidth Consumption, decrease Management. Thus virtual backbone is being employed to optimize the number and locations of the resource centers in a give Wireless Ad hoc network. Only virtual backbone situated nodes act as routers and thus other nodes need not to acquire, keep, or update routing information. Generally CDS concept is implemented as virtual backbone in Mobile Ad hoc network and it must be of Minimum Size. Algorithms to find CDS in Ad hoc networks is divided into two types of Centralized (Global) Algorithms and Decentralized (Local) Algorithms. we determine MCDS of a greph And Analysis the performance and result. The proposed algorithms for MCDS formation are analyzed that calculate the list of nodes as MCDS for the wireless ad hoc networks with pictorial representation.

I. INTRODUCTION

A Mobile Ad hoc network is a special type of wireless network in which a collection of wireless hosts with wireless network interfaces enc ompasses of a temporary network, without the aid of any established infrastructure or centralized administration. If two hosts that want to communicate are outside their Wireless Transmission Ranges, they could communicate only if other hosts between them in the Ad hoc network are willing to forward packets for them. A un-weighted graph G = (V,E) is used to represent an Ad hoc network, where V represents a set of Wireless Mobile Hosts and E represents a set of Edges.Routing Scheme in Ad-hoc networks is more challenging and tedious than traditional routing in terms of Dynamic Network Topology. Routing is an important factor, which plays a vital role to improve the Network Efficiency. All the communication schemes such as due to change in Topology, Multicast Routing Protocol is enabling to cope up with mobility. In multi hop ad-hoc networks, routing becomes more complex because of mobility of both Hosts and Routers.

Main goal of protocol is to achieve maximum performances with minimum cost according to capacity. Performance depends upon Loop Count, Delay Loss Rate, Throughput and Stability. While capacity depends upon a available resources density of network - change of Topology Bandwidth Restriction and rapid change in Network Topology are two factors which differentiate Ad-hoc network with other network. A desired feature of routing protocol is to provide fast routing without loops.Routing support for wireless hosts is presently being formulated as “Mobile IP’ Technology when the Mobile Agent moves from its Home network to a Foreign (visited) network, the mobile agent tells a Home Agent on the Home Network to which Foreign itself with that Foreign Agent on the Foreign Network. Thus, all packets intended for the Mobile Agent are forwarded by the Home Agent to the Foreign Agent who sends them to the Mobile Agent on the Foreign Network. When the mobile agent returns to its original network, it informs both agents (Home and Foreign) that the original configuration has been restored. No one on the outside networks need to know that the mobile agent moved. But in ad-hoc networks there is no concept of Home Agent as itself may be “moving”.

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II OBJECTIVE

2.1 Motivation

To generate routes Proactively or On-Demand is extremely costly for energy and resource constrained nodes in a limited bandwidth shared wireless channel. Communication by blind broadcast that induces an intolerable overhead is not a feasible solution. A backbone similar to fixed infrastructure network is required for cost effective communication and maintenance of the route. Similar to the fixed network, only a sub set of the nodes participate in the creation, updation, and maintenance of the backbone, absolving all other nodes of these tasks, conserving resources. It is therefore, proposed to restrict the routing process in

Wireless Ad hoc networks thereby, to the formation of a Virtual Backbone. A virtual backbone can reduce the communication overhead, increase the bandwidth efficiency, reduce channel bandwidth consumption, decrease the energy consumption, increase network operation life, and provides better resource management. Thus, virtual backbone optimizes information delivery in a wireless ad hoc network. A Connected Dominating Set (CDS) can be implemented as virtual backbone in wireless ad hoc networks. For an optimal backbone from connected dominating set approach, it must be of minimum size. The heuristics for CDS is divided into two sets. The first set of heuristics strive to find disconnected maximum independent set of nodes and that are joined through Minimum Spanning Tree. The second type of heuristics concentrates on evolving a CDS by growing a small trivial CDS.

2.2 Proposed Solution

Two Algorithms that utilize the Articulation Points have been proposed and evaluated. These two algorithms are variations of [2]. Proposed approach to compute the MCDS is based on implementation of articulation points [5]. The algorithm starts by selecting a Node which has Maximum Degree. Since it is a heuristic approach for selection of a node, it can increase the size of CDS. It is observed that selection of node with maximum degree may not be the right choice to start. Proposed algorithm starts with computation of articulation points in a connected graph. The two algorithms assume the existence of articulation points. The assumption is largely valid in view of the Dynamic Topology of wireless ad hoc network. The computation of CDS starts with articulation points. The set of articulation points, as provide in Theorem I in next section, is always a subset of MCDS once the articulation points are determined. Resource can be taken to grow this subset in a connected manner or to connect the elements of subset using some Algorithms.

2.2.1 Assumptions

- All nodes are located in a Two-Dimensional Plane.
- All nodes have an equal Transmission Range Unit.
- The Topology of Wireless Ad hoc network can be modeled as a Unit-Disk Graph (UDG) [7].
- Communication is Bidirectional and hence edges of UDG are undirected.
- Each host sends message by Local Broadcast and an underlying MAC algorithm perfectly schedules message to prevent any collision.
- The two Algorithms assume the existence of articulation points. The assumption is largely valid in view of the Dynamic Topology of Wireless Ad hoc networks.

2.2.2Articulation Points

A vertex S in a connected graph G (V,E) is an Articulation Point [5] if and only if the deletion of vertex S together with all edges incident to S disconnects the graph into two or more non-empty components. Where V is set of nodes and E is set of edges.

Fig. 2.1 : Articulation Points in a Graph

In Fig. 2.1, all Black nodes are Articulation Points for this Graph. Removal of Black node creates disconnected components of graph. The presence of articulation points in a connected graph is undeniable feature for Communication Network. The failure of a node that is an articulation point implies that they will always be a part of the MCDS.

2.2.3 Theorem I

Every articulation points in a connected graph are member of Minimal Connected Dominating Set.

Proof: Consider a connected graph G (V,E) in which there exist two sub graph S1 and S2 such that S1 and S2 are connected to each other only through an intermediate node T
(Fig. 2.2)

Fig. 2.2 : Connection through Articulation Points

Let D1 and D2 be the Dominating Set in sub graph S1 and S2 respectively. The existence of CDS for the graph G (V,E) implies the existence of a path between D1 of S1 and D2 of S2. Thus, T must be a member of MCDS. For given Graph, T is an articulation point which proves the theorem.

2.3 Proposed Algorithms

Two Algorithms that utilize the Articulation Points have been proposed in this section. These two algorithms are variations of [2]

2.3.1 Algorithm I

This Algorithm is an improved extension to Guha and Khuller's Algorithms [2] with addition of Articulation Point Concept. Initially all nodes of G (V.E) are colored with White. Black color nodes represent Dominating Set nodes. Gray color nodes are adjacent nodes to Black node. The algorithm runs in two phases. In first phase it finds articulation points. In second phase, it grows Dominating Set nodes in connected way.

Notations

In the connected graph G (V,E), let us consider the following assumptions –

DS - Dominating Set (colored Black),
CN - Set of Covered Nodes (Colored gray excluding DS) i.e., Adjacent nodes of DS (including DS.)
UN - Set of Uncovered Nodes (not covered by DS) and colored with White.
AP - Set of Articulation Points.
N [u] - Set of all Neighbors of u (including u). and
N (u) - Set of all neighbors of u (excluding u)

where u is a member of V.
Algorithm MCDS_ Algo I (G)
DS Φ, CN ←

Algorithm Description :

- Algorithm Starts with MCDS_Algo I with initialization of DS, CN, and UN.
- Articulation_ Points is called to calculate Articulation Points.

DFS_VISIT is called within Articulation_ Points to generate DFS Tree and identification of Articulation Points for the given Graph.Compute_I is nucleus as MCDS.The algorithm runs in two phases. In First Phase, it finds Articulation Points. In Second Phase, It grows Dominating Set Nodes in connected way.

First Phase :

This Phase proceeds as follows. All the articulation points available in a graph G are computed. Further, randomly one Articulation Point is selected and colored Black. All the adjacent White nodes of Black node are colored Gray.

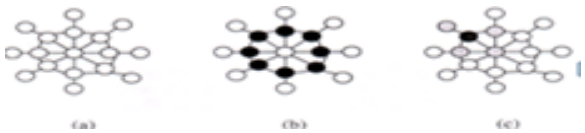


Fig. 2.3 (a – c) : Phase I of Algorithm I

For example, Figure 2.3 (a) is the given Graph to be computed. Figure 2.3 (b) shows all articulation points available in the given graph. Next in Figure 2.3 (c), a randomly articulation points is selected as Starting Node.

Second Phase : The size of Dominating Set grows in connected manner. If any Gray node is an Articulation Point, then color it Black else a Gray node with largest number of White adjacent node is selected and colored Black. Second phase is repeated till no node left in graph. Finally a series of Black nodes is generated as CDS.

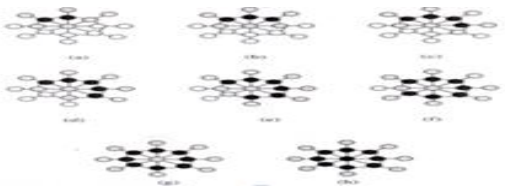


Fig 2.4 (a – h) : Second Phase of Algorithm I and (h): Equivalent Output generated by Algorithm in [2] and [3].

In second phase, if any Gray colored node is an articulation point, then it is colored Black. In Figure 2.4 (a-g), in each step, one articulation point is colored Black. It is clear that the size of the DS grows in connected manner. For the given graph, Figure 2.3 (a) in initially taken network while computed CDS is Figure 4.4 (g). Since in Figure 2.4 (g), no White nodes left i.e. UN is Null at this stage. Hence, CDS consists of all Black nodes. Obtained CDS is less in size as compared to CDS obtained from algorithms in [2] [3] as shown in Figure 2.4 (h).

2.3.2 Algorithm II

Algorithm II is similar to Algorithm I unlike the method to connect Articulation Points. Shortest Path algorithm is used to connect articulation points. The algorithm works in two phases. Initially all nodes are colored White.

A. First Phase :

Initially all articulation points are computed and if articulation points are not connected then connect them by using Shortest Path algorithms. Series of nodes are generated this way. Further, Generated Nodes (including Articulation Points) are colored Black and all adjacent nodes are colored Gray.

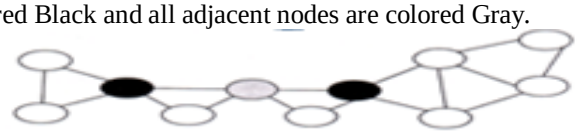


Fig. 2.5 : First Phase of Algorithm II

In the above Figure 2.5, Black nodes are the only articulation points. Since articulation points are not connected. Using shortest path algorithms a gray node is discovered to connect articulation points. This gray node is declared as part of DS and colored Black as shown in Figure 2.6. Gray nodes shown in figure 2.6 represent the Covered Nodes (CN) of Dominating Set (DS) like in Algorithm I.

Fig. 2.6 : CDS induced by Algorithm II

B. Second Phase :

A Gray node which is connected with maximum number of White adjacent nodes is selected and colored Black. Second phase is repeated till no White nodes left in the graph. Finally a series of Black nodes are generated as CDS. Second phase of Algorithm II is same as second phase of Algorithms I except no articulation points are checked. Algorithms II is also completely dependent on existence of articulation points like Algorithms I.

III ANALYSIS DETAILS

3.1 Performance Analysis

Proposed approaches are lesser complex than Guha and Khuller algorithms [2]. In terms of number of rounds runs, and size of MCDS obtained. In Best Case, proposed approach leads to Optimal size of MCDS, Best Case Analysis is not discussed in [2]. With the inclusion of Articulation Points, a subset of MCDS is identified in early phase which leads to better approximation factor. To benchmark proposed techniques, they are compared to Guha and Khuller Algorithms [2].

3.2 Analysis Framework

In this section, we compares the Average Size of the Dominating Set generated from proposed approaches with Guha and Khuller approach (CDS-based). Links are Bi-directional and two nodes are connected it they are sufficiently near. Graph in which nodes have Non-Null Degree and consist of Articulation Points is only selected. The analysis comprises of an approach that calculate the list of nodes as MCDS for the Wireless ad hoc network in graph form. For example, take a Wireless ad hoc network in a graph form like Figure 3.1 which consists of total 20 nodes including 5 Articulation Points.

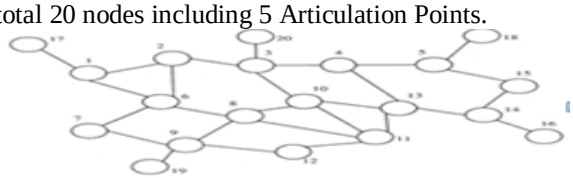


Fig. 3.1 : Randomly generated Mobile Ad hoc Network

Number belong to each node is also node ID. Nodes [1, 3, 5, 9, 14] are Articulation Points for the given Graph. Edges show that two nodes are sufficient near to communicate with each other through Bi-directional link. There is no case of any MAC Layer Collision, Interference, Hidden Station Problem and Exposed Station Problem.

3.2.1 Analysis Framework of Proposed Algorithm I

This Algorithm is an improvement on Guha and Khuller's Algorithm with addition of Articulation Point Concept. This Algorithm runs in two Phases. In First Phase, it finds Articulation Points. In Second Phase, it generates Dominating Set Nodes in Connected manner.
Let us Consider Network which consists of 10 Nodes.

Fig. 3.3 :N/w 10 Nodes

Algorithm I
First Phase

Step 1 : All Articulation Points of Graph are computed. In the above Graph, Articulation Points are Nodes [1, 3, 4, 6].
Step 2 : Now, randomly select any one Articulation Point and color it Black. Suppose, we have selected Node [4].
Step 3 : Now, all the Adjacent White Nodes of Black Node i.e. Node [5] are colored Gray i.e. in our case Nodes [1, 5, 6, 9].

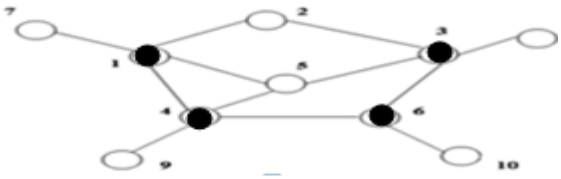


Fig. 3.3 (a) : Computed APs [1, 3, 4, 6]

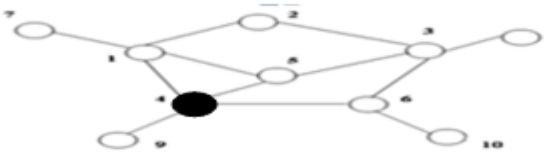
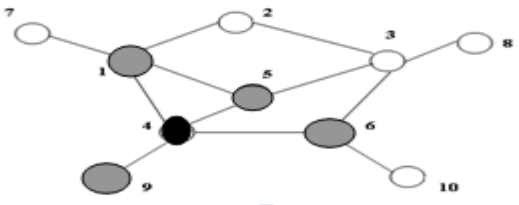


Fig. 3.3 (b) : AP [Node 4]



Second Phase

The size of Dominating nodes generates in Connected manner. The main idea of this Phase is to grow Dominating Set. This Phase works as follows :

Step 1 : If any Gray colored Node is an Articulation Point, then color it Black.
Step 2 : Else, a Gray Node with Largest number of White Adjacent Nodes is selected
Step 3 : Now, Repeat Step (3) of Phase I.

Now, we will move further by taking into account the steps involved in IInd Phase in terms of Iterations.
Iteration 1 (Fig. 3.3 (d))

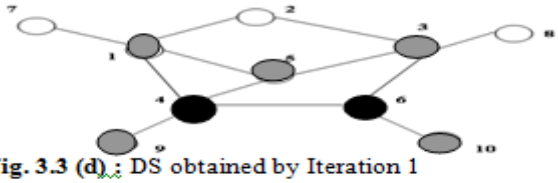


Fig. 3.3 (d) : DS obtained by Iteration 1

Iteration 2 (Fig. 3.3 (e))

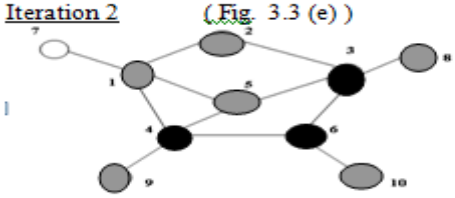


Fig. 3.3 (e) : DS obtained by Iteration 2

Iteration 3 (Fig. 3.3 (f))

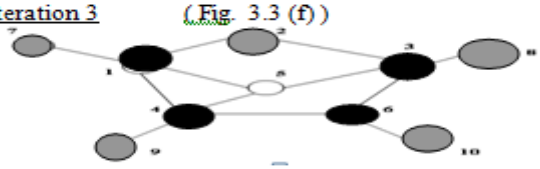


Fig. 3.3 (f) : DS obtained by Iteration 3

Note : The above generated MCDS is the Final Output of Algorithm I.

With the help of above Calculations, it is clear that MCDS Nodes generated by Algorithm I are [1 3 4 6]. Hence, total number of Nodes obtained by proposed Algorithm I is four which is better then Guha Khuller's Algorithm.

3.2.2 Analysis Framework of Proposed Algorithm II

The Algorithm II is almost similar to Algorithm I unlike the method to connect Articulation Points.. Articulation Point acts as a connecting link between two Graphs or Networks.

Algorithm II

First Phase

Step 1 : All Articulation Points of Graph are computed. In the above Graph, Articulation Points are Nodes [1, 3, 4, 6].

Step 2 : If Articulation Points are not connected, then connect them by means of Shortest Path Algorithms.

Step 3 : Further, Generated Nodes are colored Black and all adjacent nodes are colored Gray.

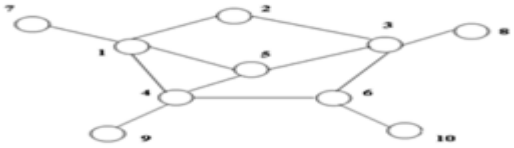


Fig. 3.4 : N/w of10 Nodes

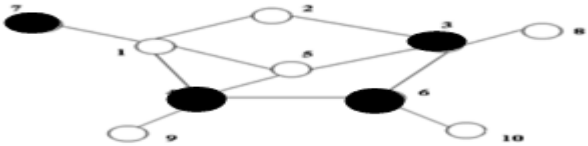


Fig. 3.4 (a) : APs [1, 3, 4, 6]

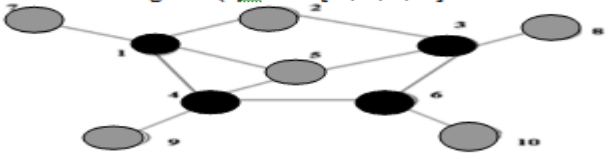


Fig. 3.4 (b) : Adjacent Nodes of APs are colored Gray

Since in the above Graph, all the Nodes of Graph have been covered i.e. no node left in the Graph to be unreachable by DS. Hence, there is no need to move onto 2nd Phase. Therefore, the above Graph has generated the Final Output.

Second Phase

This Phase encompasses of Discovery of Gray Nodes in terms of Iteration. A Gray Node with Maximum number of White Adjacent Nodes is selected and colored gray. Finally, a Series of Black Nodes is generated as CDS. This Phase proceeds as follows :

Step 1 : Else, a Gray Node with Largest number of White Adjacent Nodes is selected and color it Black.
Step 2 : Now, the nodes which are adjacent to Black Node are colored as Gray.
Step 3 : Repeat Steps (1 & 2) till no Node is left in the Graph and complete CDS is found.

3.3 Variations in MCDS generated by Guha Khullers & Proposed Algorithm I & II

This section depicts the variations in MCDS Nodes obtained by performing the calculations by applying Algorithm I & Algorithm II which shows the modifications on existing Algorithm.

3.3.1 Output generated by Guha and Khuller (CDS based) Algorithm [13]

MCDS nodes generated by algorithm are [1 2 3 4 5 6 7 9 10 13 14] and represented by Black nodes in Figure 3.5. Total number of nodes in MCDS is Eleven.

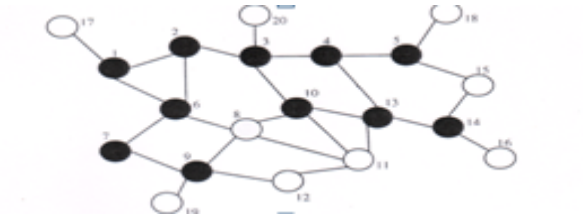


Fig. 3.5 (a) : Output generated from Guha & Khuller Algorithm (for Network of 20 Nodes).

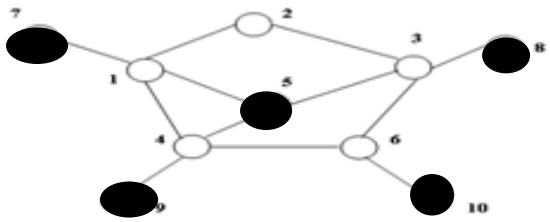


Fig. 3.5 (b) : Output generated from Guha & Khuller Algorithm (for Network of 10 Nodes).

3.3.2 Output Generated by Proposed Algorithm I

MCDs nodes generated by Algorithm I are [1 3 4 6] and represented by Black nodes in Figure 5.6(a). Total number of nodes in MCDS is four.

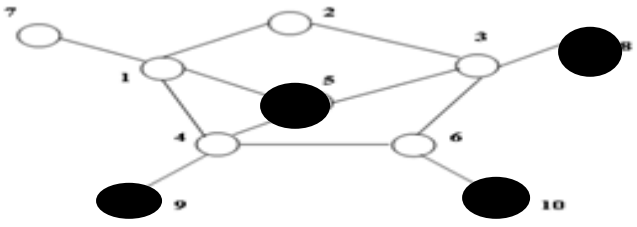


Fig. 3.6 (a) : MCDS generated by Proposed Algorithm I

3.3.3 Output generated by Proposed Algorithm II

MCDS nodes generated by Algorithms are [1 3 4 6] and represented by Black nodes in Figure 5.6(b). Total number of nodes in MCDS is four.

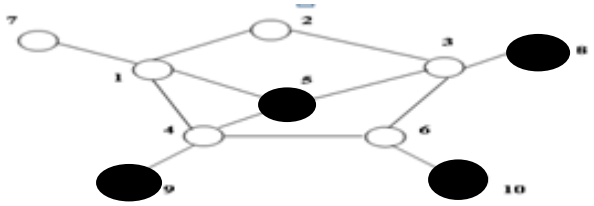


Fig. 3.6 (b) : MCDS generated by Proposed Algorithm II

IV RESULTS

In this section, we compare the size of the Dominating Set generated from proposed approaches with Guha and Khuller approach (CDS-based). Graph has only considered nodes which have Non-Null Degree and consist of Articulations Points. Analysis shows that proposed approaches generate lower size of MCDS as compared to Guha and Khuller (CDS based) approach. Result is justified by the fact that proposed approach chooses the node which are Articulation Points. Every articulation points are member of MCDS.

Analysis shows the performance of Algorithm II is Best as compared to other approaches. For example is Network of 10 Nodes, in which the size of MCDS generated by Guha Khullers CDS based algorithm is 5 where as by Algorithm I is 4 and by Algorithm II is 4.Performance of Algorithm II is Best in all respects. The MCDS obtained by both Algorithm I and Algorithm II is four but it is important to note that Algorithm II has generated MCDS in less Iterations which is much better than Algorithm I that generated the MCDS in more iterations. Finally, Performance can be written in increasing order like :

Guha Khullers (CDS - based) Algorithm < Algorithm I < Algorithm II.

V CONCLUSIONS

This paper proposed different algorithms for calculating Connected Dominating Set in the Mobile Ad - hoc Networks. Dissertation introduced the implementation of Articulation Point concept into MCDS problem and discussed how to find the MCDS problem using Articulation Points. Analysis shows that inclusion of articulation point concept gives a better solution compared to Heuristic Approach by Guha and Khullers. In Average Case and Best Case proposed approaches have less time complexities.

VI FUTURE SCOPE

Proposed Algorithms is not suitable for Dense Mobile Ad hoc network. It would be interesting to study that how such an approach could be developed for Dense Wireless Ad hoc networks.The proposed Algorithms belongs to Centralized Version. The Future works will extend the proposed algorithms to generate Maximum Independent Set based on Articulations Points and then formation of a Dominating Tree and so it can lead towards Localized Algorithms.

REFERENCES

[1] Tao Lin Scott F. Midkiff jahng S. Park, " Minimal Connected Dominating set Algorithms and Applications for a MANET Routing Protocol, " Proc. IEEE international. Conference on Communications, June 1997, pp. 157-164.

[2] S. Guha and S. Khuller, ' Approximation Algorithms for Connected Dominating Sets, " Proc. European Symp. On Algorithm, 1996, pp. 179-193.

[3] B. Das and V. Bhargavan, " Routing in ad-hoc networks using minimum, connected dominating sets, ' Proc. IEEE International Conference on Communications, June1997, pp. 376-380.

[4] D.B. West, ' Introduction to Graph theory,. " 2nd ed., Prentice Hall, Upper Saddle River, NJ 2001, pp. 116-118.

[5] I. D. Aron and S. K. S. Gupta, "On the scalability of on-demand routing protocols for mobile ad hoc networks: an analytical study," in *Journal of Interconnection Networks*, vol. 2, no. 1, pp. 5-29, 2001.

[6] D. Johnson, "*The Dynamic Source Routing Protocol for Mobile Ad Hoc Networks (DSR)*", IETF Internet Draft, draft-ietf-manet-dsr-09.txt, April 2003.

[7] D.B. Johnson, D.A. Maltz, and J. Broch, "*DSR: The Dynamic Source Routing Protocol for Multi-Hop Wireless Ad Hoc Networks*", Ad Hoc Networking, pp. 139-172, 2001.

[8] V.C . Patil1, Rajashree. V. Biradar2, R. R. Mudholkar3 and S. R. Sawant4 "On Demand Multipath Routing Protocols for Mobile Ad Hoc Networks Issues & Comparison"International Journal of WirelessCommunication and Simulation Volume 2 November 1 (2010), pp. 21–38

Model Order Reduction By MixedMathematical Methods

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ABSTRACT
In this paper, a mixed method mathematical technique is proposed for finding reduced order model of Single-Input Single-Output (SISO) system. The model reduction of large scale systems is achieved by using Padé approximation and utilizing the characteristics of the higher order system which is maintained in the reduced model. The denominator polynomial of the reduced model is determined by the characteristic equation which retains the basic characteristics of the original system, and the coefficients of the numerator polynomial are obtained by using the Padé approximation technique.

Index Terms: *Integral Square Error, Padé Approximation, Single-Input Single-Output*

I. INTRODUCTION

The approximation of high-order complex systems to low-order simple models has been the concern of many researchers during the last two decades. The low-order simple model can replace the original one to facilitate the design and online implementation of the feedback controllers and digital filters. The ease with which the analysis can be performed depends mainly upon the complexity of the model. Simple lower order models are very desirable in the design of control systems, as the analysis of higher order systems is usually cumbersome and mathematically intensive. The purpose of obtaining reduced model is to provide a good approximant for the higher order systems, maintaining the characteristics of the latter as much as possible. Nowadays, systems have become complex and the interrelationship of many controlled variables need to be considered in the design process.

Various model reduction methods have been proposed. Two approaches have attracted much attention in this field and are worth mentioning. These are Moore's balanced realization [1] and optimal Hankel norm approximation [2]. During the past three decades, several more model order reduction techniques have been developed [6-9]. Each of them has their own merits and applications. In recent times, mixed mathematical techniques [10-11] have gained much importance in model order reduction of large scale Single-Input Single-Output (SISO) systems. Extensions of these SISO techniques for MIMO systems are not trivial. Shamash [3] has proposed a multivariable system reduction using Padé Approximation and dominant eigen values. This method assumes that the dominant pole of the higher order system are known, and hence suffer from the drawback of its applicability to systems with no dominant poles, or where the dominant poles are difficult to identify. Pal [4] has developed a system reduction methodology using the continued fraction approach and Routh Hurwitz Array, in which the initial transient response of the reduced order model might not match with the higher order system, as only the first few time moments are considered depending upon the order of the reduced model. The viability and limitations of similar methods have been discussed by Shamash [5].

Recently, mixed methods are getting greater attention in the model order reduction of MIMO systems. In these methods, the common denominator of the transfer function of the reduced order model is fixed by using a stability preserving algebraic method, while the numerators are obtained using one of the available model reduction methods.

II. PROPOSED METHOD

In this proposed method the advantages of mixed method of model order reduction is used for Single-Input Single-Output (SISO), where the numerator is reduced by Padé Approximation [17] and second order reduced denominator is derived by utilizing the basic characteristics [19] of higher order original system. These characteristics are undamped natural frequency of oscillations (ω_n), damping ratio (ξ), settling time (T_s), peak

amplitude (P_a) and peak time (T_p). the reduced second order approximant maintains the characteristics of the original system. This method tries to minimize the Integral Square Error (ISE) and the reduced second order model behaviour to the input signal almost matches with the original system behaviour.

Padé Approximation:
An asymptotic expansion or a Taylor expansion can often be accelerated quite dramatically by being re-arranged into a ratio of two such expansions.

A Padé approximation

$$G(s) = \frac{\sum_{k=0}^{M} a_k s^k}{\sum_{k=0}^{N} b_k s^k} \qquad \text{(i)}$$

(normalized by $b_0 = 1$) generalizes the Taylor expansion with the same total number of coefficients:

$$T_{M+N}(s) = \sum_{k=0}^{M+N} c_k s^k \qquad \text{(ii)}$$

(the two expansions being the same in the special case of M = 0). From a truncated Taylor expansion (ii), one determines the corresponding Padé coefficients by requiring that if (i) is Taylor expanded; the result shall match all the terms given in (ii).
Such that:

$$G(s) = \frac{\sum_{k=0}^{M} a_k s^k}{\sum_{k=0}^{N} b_k s^k} = c_0 + c_1 s + c_2 s^2 + \ldots..$$

The coefficients of the power series can be calculated as:

$c_0 = a_0$
$c_k = 1/b_0[a_k - \sum_{j=1}^{k} b_j c_{k-j}]; \; k > 0$
$a_k = 0 \qquad\qquad k > n-1$

Hence, Padé Approximants can be given as:

$a_0 = b_0 c_0$
$a_1 = b_0 c_1 + b_1 c_0$
.
.
. $\qquad a_{k-1} = b_0 c_{k-1} + b_1 c_{k-2} + \ldots + b_{k-1} c_1 + b_k c_0$

The reduced model's transfer function can be formed by using Padé Approximants in the numerator and the denominator is derived by the basic characteristics of higher order systems as:

$$G(s) = \frac{a_0 + a_1 s}{s^2 + 2\xi\omega_n s + \omega_n^2}$$

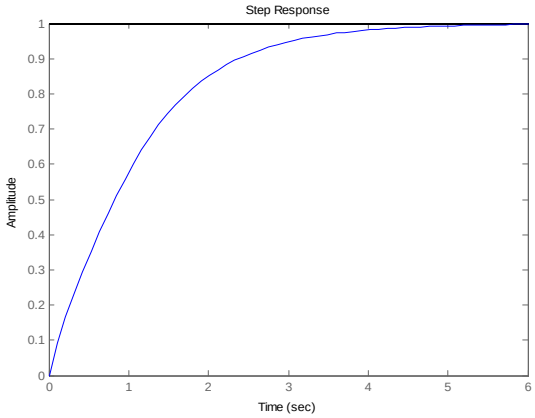
III. NUMERICAL EXAMPLE

Consider a fourth order system:

$$G(s) = \frac{s^3 + 7s^2 + 24s + 24}{s^4 + 10s^3 + 35s^2 + 50s + 24}$$

Characteristics:
Rise Time: 2.2609
Settling Time: 3.9312
Settling Min: 0.9062
Settling Max: 1.0000
Overshoot: 0
Undershoot: 0
Peak: 1.0000
Peak Time: 10.4907

The unit step response can be shown as:



Reducing the denominator by utilising the characteristics of the system, like damping ratio (ξ), undamped natural frequency of oscillations (ω_n) etc.

For an aperiodic or almost periodic system, $\xi = 0.99$, number of oscillations before the system settles = 1

Since, $\omega_n = 4/\xi * T_s$
Therefore, $\omega_n = 4/ (0.99*3.93) = 1.0281$

Reduced denominator:

$D_2(s) = s^2 + 2\xi\omega_n s + \omega_n^2$
Therefore, $D_2(s) = s^2 + 2.0356s + 1.0569$

Now, reducing numerator by Padé Approximation:

$b_0 = 1.0569$
$b_1 = 2.0356$
$c_0 = 1$
$c_1 = - 1.08333$
Now, reduced model representation:

$$G(s) = \frac{a_0 + a_1 s}{s^2 + 2.0356s + 1.0569}$$

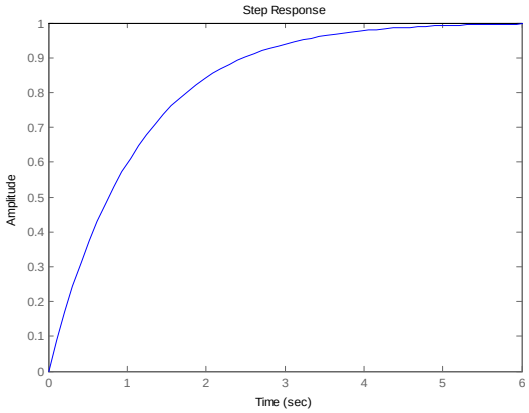
$a_0 = b_0 c_0 = 1.0569$
$a_1 = b_0 c_1 + b_1 c_0 = 0.891$

Hence, final reduced model:

$$G(s) = \frac{1.0569 + 0.891s}{s^2 + 2.0356s + 1.0569}$$

Its characteristics can be given as:
Rise Time: 2.3589
Settling Time: 4.1169
Settling Min: 0.9021
Settling Max: 1.0000
Overshoot: 0
Undershoot: 0
Peak: 1.0000
Peak Time: 10.3072

The unit time step response can be shown as:



Integral Square Error, ISE = 5.1018×10^{-4}

IV. CONCLUSION

In this work a mixed mathematical technique has been proposed for model reduction. It can be clearly seen from the step response that the reduced model is in close approximant with the original model and tries to minimize the error. If the original model is stable, the reduced model must also be stable. The proposed technique is evaluated for Linear Time Invariant Single-Input Single-Output (SISO) system, and the result proves to be better than the past proposed methods. This method utilises the basic characteristics of the higher order system and forms second order approximant that resembles the second order characteristics equation. The method is computationally simple and reduced model stability is assured if the original system is stable.

REFERENCES

[1] B. C. Moore, "Principal Component Analysis in Linear Systems: Controllability, Observability and Model Reduction", *IEEE Transactions*, Automatic Control, January 1981, vol. 20, issue 1, pp. 17-31.

[2] K. Glover, "All Optimal Hankel-Norm Approximation of Linear Multivariable Systems", *International Journal of Control*,1984, vol. 39, issue 6, pp. 1115-1193.

[3] Y. Shamash, "Multivariable System via Modal Methods and Pade Approximation", Automatic Control, *IEEE Transactions*, Automatic Control, 1975, vol. 20, page: 815-817.

[4] J. Pal, "System Reduction by Mixed Method", *IEEE Transactions*, Automatic Control, 1980, vol. 25, issue 5, pp. 973-976.

[5] Y. Shamash, "The Viability of Analytical Methods for The Reduction of Multivariable Systems", *IEEE Proceedings*, 1981, vol. 69, issue 9, pp. 1163-1164.

[6] T.N. Lucas, "Continued-fraction Algorithm for Biased Model Reduction" Electronic Letters, 1983, vol. 19, issue 12, pp.444–445.

[7] S.A. Marshall, "The Design of Reduced Order Systems," *International Journal of Control*, 1980, vol. 31, issue 4, pp.677–690.

[8] C. Hwang, "On Cauer third continued fraction expansion method for the simplification of large system dynamics." *International Journal of Control*, 1983, vol. 37, issue 3, pp.599–614.

[9] P.O. Gutman, C.F. Mannerfelt, P. Molander, "Contributions to the model reduction problem," *IEEE Transactions*, Automatic Control, 1982, vol. 27, issue 2, pp.454–455.

[10] G. Parmar, S. Mukherjee, R. Prasad "System Reduction using Factor Division Algorithm and Eigen Spectrum Analysis" *International Journal of Applied Mathematics Modelling*, 2007, vol. 31, pp. 2542-2552.

[11] T. C. Chen, C. Y. Chang and K. W. Han, "Model Reduction using Stability Equation Method and the Continued Fraction Method" *International Journal of Control*, 1980, vol. 32, issue 1, pp. 81-94.

[12] R. Prasad, S. P. Sharma and A. K. Mittal, "Improved Pade Approximants for multivariable systems using stability equation method", *J. Inst. Eng. India* IE(I), 2003, vol. 84, pp. 161-165.

[13] R. Prasad, S. P. Sharma and A. K. Mittal, "Linear model reduction using the advantages of Mihailov criterion and factor division", *J. Inst. Eng. India* IE(I), 2003, vol. 84, pp. 7-10.

[14] R. Prasad, J. Pal, A. K. Pant, "Multivariable system reduction using model methods and Pade type approximation", *J. Inst. Eng. India* pt EL, 1998, vol. 79, pp. 84-90.

[15] R. Prasad, "Pade type model order reduction for multivariable system using Routh approximation", *Computers and Electrical Engineering*, 2000, vol. 26, pp. 445-459.

Enterprise Management Information System: Design & Architecture

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ABSTRACT
The field of information systems deals with systems for delivering information and communications services in an organization and the activities and management of the information systems function in planning, designing, developing, implementing, and operating the systems and providing services. These systems capture, store, process, and communicate data, information, and knowledge. The systems combine both technical components and human operators and users. The environment is an organization or a combination of organizations. The process of Automation implicitly refers to the use of Information Technology for the development of Information system. Automation of information systems in organizations has been a thrust area since several years now. With the introduction of new technologies and reduction in their cost the affordability of automation of activities in different organizations has grown significantly [1][4].

I. INTRODUCTION

It is observed that like many other organizations several independent Information Systems have emerged over the period of time in enterprise. Thus, integration of all information systems in such situations, so that they interchange information seamlessly and provide the single-system image to users, is very significant [2] [4]. Data warehouse has been conceded as a practical way to collect, process, and represent valuable information to support management decision making [15][18] and has gained significant applications over the past several years [19].

The ISs are studied in 2 aspects: database structure and computer architecture, of which the part of database is presented in this paper. The results of database analysis are used as basis of the design process. In the ISIP, only conceptual design is done, i.e., the logical configuration of database interconnections and technological standards are specified. Then, the managerial information, such as implementation priority and budget, is added to document the final report.

As a result of analysis, all databases share some identical data items, of which information updating requires only batch processing. Thus, database replication and application program interface (API) techniques are specified for integration of databases with identical and different database management systems, respectively. In addition, the data warehouse, in which all significant data for management is collected and stored in the meaningful format, is recommended to be implemented to support management decision-making.

II. METHODOLOGY

The IS integration plan is executed by the IT consultant team enterprise. The team consists of specialists in various areas: project management, information system analysis and design, database design, computer networks, etc. The integration can be accomplished by applying the methodology which has three phases:

Phase 1: Review and analysis. In this step, the existing information systems being under operations and during acquisition processes are investigated [1][2]. The study is conducted in two aspects:

[1] Program and data structures, and 2) computer architecture and networks. For program and data structure analysis, relationships among database tables (files) and between programs and the corresponding database tables are extracted. The database tables are clustered into groups, in which for a particular group the tables have tight relationships with each other and loose relationships with others in another groups. In addition, data items shared among databases of different systems are identified and then classified into various types. For computer architecture analysis, system configurations and network topologies are studied. The study

results are used as basic information in the next phase: conceptual design. The information required in review and analysis phase of IS projects is collected from analysis and design specification documents of the projects.

Phase 2: Conceptual design. The objectives of this step are to conceptually design a configuration of databases and computer networks integration, so that information can be interchanged seamlessly and overall systems have a single-system image to users. The Design is done on the basis of distributed computing architecture. This is because the UNIVERSITY is a large organization and has distributed management strategies, for which centralized processing architecture is improper. In this design, only a logical configuration of database integration, conceptual techniques of database access, and technological standards to be used are specified.

Phase 3: Final report documentation. In this step, the conceptual design specification report in Phase 2 is extended with managerial information such as implementation plan, investment plan, human resources development, IS management organization, etc. to be the final report. Together with the submission of the report in each phase, the conference presenting the findings, designs, and recommendations is organized to ensure the project being executed properly.

III. SYSTEM ANALYSIS

Presently the Enterprises have implemented several computerized information systems to enhance the service quality and efficiency for customers and employees. Such systems range from a transaction-processing system, which supports operational staffs on day-to-day basis jobs, through executive information system, which analyzes and provides valuable information to support the management in decision making. Thus, it is necessary to study all current information systems being operated and information system projects to be implemented in the future. The methodology described is applied by separation of information systems analysis and design into two aspects: 1) program and data structures, and 2) computer architecture and networks. The databases analyzed by investigating the relationships among tables (files) so that they can be clustered into groups. The following describes the results of review and analysis of programs and data structures.

Management information system (MIS Phase I) The MIS Phase I is a transaction processing system that was developed to support day-to-day operations in seven functional areas: fixed asset management, personnel management, accounting, finance, budgetary management, revenue management, and procurement management.Each subsystem gets access only to its own particular groups, not spread through all groups. As an example, the fixed asset management subsystem normally accesses only its own groups: inventory control and asset management.

Personal identification card information system. This system is developed in order to improve the services for the people dealing with records and personal identification cards, the architecture of the system is client/server.

Customer Query and Information System. This system is developed in order to record and maintain complain information and to track the corresponding actions of responsibility units, so that all complaint are responded rapidly and properly. The complaining information system is operated under the identical server and networks of the MIS Phase I. The complaining database has totally n tables with another m tables from the MIS Phase I. Those n tables are clustered into x groups: say complaining data containing 10 tables, Action Data containing 9 tables, and response data containing 4 tables.

Enterprise Information System: University Case Study

Examination System. This system has to be developed in order to support most of the examination related operators. The main functions are: Enrollment preparation of Students, Award Entry, Post Graduate and Under Graduate Result preparation, Printing of Marks Cards, Degree Certificates and Provisional Certificates, etc. The architecture of the system is client/server, of which the operating systems of client terminals and server are MS-Windows and UNIX. The Data entry for awards is mostly carried on UNIX and rest of the Data entry is carried on Windows operating systems. The database management system is specified to be Oracle, SQL and FoxBASE (for UNIX), so that data is shared seamlessly with the Information System. As the results of analysis, the overall 242 dynamic relational tables are clustered into 20 groups. Tables in each group are tightly related to each other internally, while they are weakly tied with others in another groups. This design provides database modification to be done in an easy manner.

[1] **Document image-processing system.** The objectives of this system are to archive and retrieve information in the format of image data, so that proper documents can be searched and retrieved in an effectively manner. The system is mainly used in the photograph mapping, paper evaluation and form mapping of student records. This system has a client/server architecture, of which the server is SQL and Windows platform. The document image-processing system has maintained data in a 2 categories. Text Data in relational database format and image data in image file format.

[2] **Library Information system.** This information system is designed for the Library of the University. The system to be developed to support day-to-day operations of the Library under ministration of UNIVERSITY. The architecture of the system is host-based processing, of which database management system is SOUL. There are totally 65 tables, which are clustered into 12 groups. However, UNIVERSITY has only the license of executable programs. This information system also has access to 8000 National and International Journals. It is recommended to initiate a new project to develop new programs, so that the UNIVERSITY owns source programs and reduces maintenance budget in long terms.

[3] **Executive information system (EIS Phase I).** This is only a part of executive information systems to be developed in for University. EIS Phase I was designed to support management in 4 functional areas: revenue management, budgetary management, personnel management, and asset management.All data is collected and summarized from the database of MIS Phase I. The system is developed by using SQL Express and VB. However, EIS Phase I has not been yet used by management because the database of MIS Phase I is still incomplete.

[4] **Other information systems.** These information systems are currently under either development or acquisition processes as indicated in (2). Then, analysis was accomplished by investigating only the design documents of consultant teams. The followings are found from analysis of those information systems:

each system is client/server architecture, of which the database is centralized in only the database server of each system,
most systems have maintained some data items redundantly with the database of MIS Phase I, there is not any technical specification for interconnecting those databases

IV. CONCLUSIONS

The paper presents the summary details of the MIS setup for enterprise, a part of the information system integration plan of the enterprise. The consultant team has to apply the methodology consisting of three steps: review and analysis of current information systems, conceptual design of database integration, and final report documentation. The plan covers the most significant information system project in the UNIVERSITY. Those information systems are investigated in 2 aspects: database structure and computer system architecture. The results reveal that, for a particular information system, the database can be clustered into several groups..

REFERENCES

[1] Mehraj-ud-Din, Nazima Chesti, “Information System Automation: Problems and Issues”, presented in J 7 K Science Congress of 2006.
[2] Mehraj-ud-Din Systematic Approach to Automation, presented in J & K Science Congress of 2006.
[3] Mehraj-ud-Din, Majid Zaman, Muheet Ahmed Data Security through Encryption”, , presented in science congress 2006.
[4] Inception Report of University of Kashmir Information System Integration Plan: Information System Review, 2003.
[5] R. Agrawal, A. Gupta, and S. Sarawagi, "Modeling multidimensional databases", IBM Research Report, 1995.
[6] J.W. Buzydlowski, I. Song and L. Hassel. "A Framework for Object-Oriented On-Line Analytic Processing", Proc. of the 1st Int. Workshop on Data Warehousing and OLAP (DOLAP’98), Washington D.C., November 1998.
[7] L. Cabibbo, and R. Torlone, "Querying Multidimensional databases", 6th Workshop on Database Programming Languages (DBPL’97), 1997.
[8] Cabibbo, L., and Torlone, R., "A logical Approach to Multidimensional Databases". Lecture Notes in Computer Science, n. 1377, Proc. of the 6th Int. Conf.on Extending Database Technology, (EDBT’98), Valencia, March 1998, pp. 183-197.
[9] A.F. Cardenas, "Analysis and performance of inverted database structures", Comm. ACM, vol. 18, n. 5, pp. 253-263, 1975.
[10] C.D. French, " 'One Size Fits All' Database Architectures Do Not Work for DSS", Proc. ACM SIGMOD Conf., 1995, pp. 449-450.
[11] M. Golfarelli, D. Maio, and S. Rizzi, "Conceptual design of data warehouses from E/R schemes", Proc. HICSS-31, VII, Kona, Hawaii, 1998, pp. 334-343.
[12] M. Golfarelli, D. Maio, and S. Rizzi, "The Dimensional Fact Model: a Conceptual Model for Data Warehouses" to appear on Int. Jour. Computer and Information Systems.
[13] A. Gupta, V. Harinarayan, and D. Quass, "Aggregate query processing in data warehousing environments", Proc. 21st Very Large Database Conf.(VLDB95), 1995, pp. 358-369.
[14] H. Gupta, "Selection of views to materialize in a data warehouse", Proc. Int. Conf. on Database Theory, Athens, Greece, 1997.

[15] M. Gyssens, and L.V.S. Lakshmanan, "A foundation for multi-dimensional databases", Proc. 23rd Very Large Database Conf. (VLDB97), Athens, Greece,1997, pp. 106-115.Journal of Computer Science and Information Management, Vol. 2, N. 3, 1999
[16] S. Kelly, "Data Warehousing in Action", New York: John Wiley & Sons, 1997.
[17] R. Kimball, "The data warehouse toolkit", New York: John Wiley & Sons, 1996.
[18] R. Kimball, L. Reeves, M. Ross and W. Thornthwaite, "The data Warehouse Lifecycle Toolkit", NewYork: John Wiley & Sons, 1998.
[19] A. Koeller, E.A. Rundensteiner and N. Hachem, "Integrating the Rewriting and Ranking Phases of View Synchronization", Proc. of the 1st Int. Workshop on Data Warehousing and OLAP (DOLAP'98), Washington, D.C. November 1998.

A Novel Approach for Filtering Unrelated Data from Websites Using Natural Language Processing

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ABSTRACT
Day by day review or opinion can be taken by number of websites. Either it's related to movie review or anything else. Every times it's not necessary that user post his/her opinion or review for particular subject only.so to filter out such unrelated comments or review we proposed a structure which is based on natural language processing. Our proposal first extract the comments or reviews from the particular site using web crawling concept and then it will processed on such data using natural language processing.so finally we will get the data which is only related to particular post.

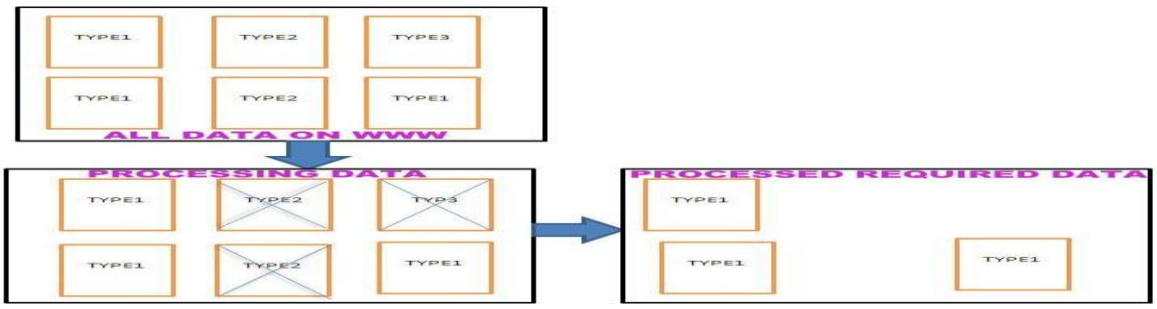
Key Words*: Data Extraction, Natural Language Processing, Wrapper , Opinion, Web Crawling, seed, fetch*

I. INTRODUCTION

World is full of valuable data. In all that data to get our required or related data in a formatted way it is not easy task product listing, Business directories, Inventories etc data managing is very tedious.so that there are number of technique available and based on those technique number of soft wares are available to analyze the data. We are going to implement such intelligence technique among them by which we can easily manipulate the data [1].In this paper we are going to mash up three different concepts like data extraction, web crawling which is used for data extraction process and last natural language processing for processing that particular extracted data. Traditional approach for extracting data from web source is to write specialized programs, called Wrappers. what wrapper exactly do to identify data of interest and map them to some suitable format like relational database or XML.[3] In other words, the input to the system is a collection of sites, (e.g. different domains), while the output is a representation of the relevant information from the source sites, according to specific extraction criteria.[4] we can applied such technique for data extraction purpose to different types of text like newspaper articles, web pages, scientific articles, newsgroup messages, classified ads, medical notes etc.[2]

II. HOW EXTRACTION WORK?

First machine find numbers of data when we want to some specific type of data for extraction then it filter another data. Take a look in figure which gives basic idea. Figure represent that initially we want the data of type1 then what machine started processing all the data. And from that it gives our required data that is type1 data. This is what we can say wrapping the data. Now as we discuss that number of techniques are available for data extraction like natural language processing, language and grammars, machine learning, information retrieval, database and ontologies are there. [3] In those different technique we are going to implement natural language processing technique. During my work on this topic I found if we want to reliable data in simple way. Then we will go for natural language processing technique. Here one more diagram which give the flow of extracting the data. [Figure 2]



Figure[1]:Meaning of Data Extraction in pictorial format.

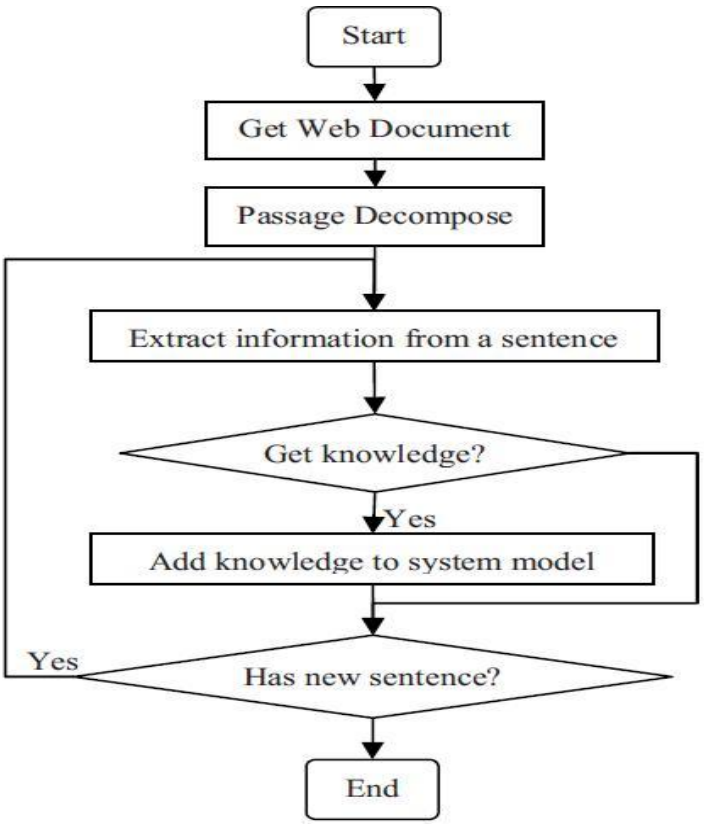


Figure [2]: Flow of extracting the data.

From Figure [2] we get basic idea that how data extraction can be done. This is basic idea of data extraction we are going to extract particular data from particular website so here we introduce one more concept that is web crawling concept.

III. HOW WEB CRAWLING CONCEPT WORK IN OUR PROPOSED STRUCTURE

- **Web crawling**
  Generally crawling is depending on string or parameter which are given to it as parameters which is called Seeds, they are added to a URL request queue. Crawler starts fetching pages from the request queue. And then parsed that downloaded page to find link tags that might contain other useful URLs.New URLs added to the crawler's request queue, or frontier. It will continue until no more new URLs or disk full.

- **Freshness**
  Web pages are constantly being added, deleted, and modified Web crawler must continually revisit pages it has already crawled to see if they have changed in order to maintain the freshness of the document collection stale copies no longer reflect the real contents of the web pages
- **Focused Crawling**
  Attempts to download only those pages that are about a particular topic used by vertical search applications. and rely on the fact that pages about a topic tend to have links to other pages on the same topic popular pages for a topic are typically used.
  Basically Crawler uses text classifier to decide whether a page is on topic.

IV. PROCESSING STEPS IN NATURAL LANGUAGE PROCESSING

Natural language processing is the automatic ability to understand text or audio speech data and extract valuable information from it.[2] the ultimate objective of natural language processing is to allow people to communicate with computers in much the same way they communicate with each other. More specifically, natural language processing facilitates access to a database or a knowledge base, provides a friendly user interface, facilitates language translation and conversion and increase user productivity by supporting English

like input.[4] natural language processing is defined in vast area where it has been used either it would be main field like automatic summarization,coreference resolution, discourse analysis, machine translation, morphological segmentation, named entity recognition, natural language generation, natural language understating, optical character recognition etc or it may be used in sub fields like information retrieval, information extraction, speech processing etc.[5]

- Morphological Analysis: Individual words are analyzed into their components and non word tokens such as punctuation are separated from the words.
- Syntactic Analysis: Linear sequences of words are transformed into structures that show how the words relate to each other.
- Semantic Analysis: The structures created by the syntactic analyzer are assigned meanings.
- Discourse integration: The meaning of an individual sentence may depend on the sentences that precede it and may influence the meanings of the sentences that follow it.
- Pragmatic Analysis: The structure representing what was said is reinterpreted to determine what was actually meant.

V. PROPOSED STRUCTURE FOR OPINION EXTRACTION

Figure [3] gives clear idea that how number of input we take. And based on some pre decided rules and thesaurus we can categorized review.Actually what we are going to implement is first we extract solutions from website discussproblems.com which is based on sharing problems and giving solution for it. Extracting that data with the help of web crawling conception that we are processing on text with help of pre defined rules that based on which criteria particular comment or opinion is good, medium or any abuse thing. If there are N rules matching the same piece of text, we first rank rules preliminarily according to their own extracting accuracy [9].

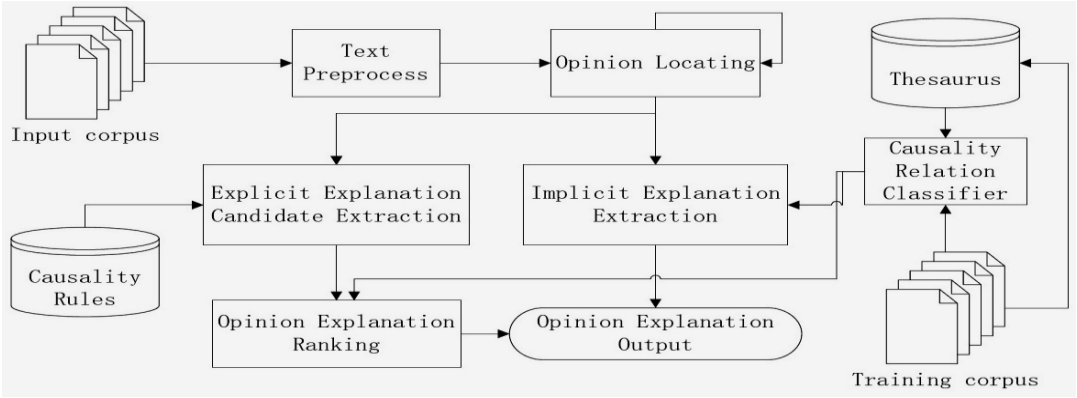


Figure [3]: **The process of our extraction method**

And using Natural Language Processing various step we easily identify either posted comment is positive or negative. So we any unrelated posts are found then it will be filtered out.

VI. PARAMETER WORK ON

For checking particular sentence some parameters come into picture. With help of that parameters we easily manipulate for particular statement.

- **Precision**

$$Precision = \frac{\#\text{ correct answers}}{\#\text{ answers produced}}$$

- **Recall**

$$Recall = \frac{\#\text{ correct answers}}{\#\text{ total possible corrects}}$$

- F-measure

$$F = \frac{(\beta^2 + 1)PR}{\beta^2 P + R}$$

So, these are the basic parameter on which we can find the correctness of the particular statement.

VII. EXPERIMENTAL DATA

For Experimental purpose we developed one site that is DiscussProblems.com with the help of antique brains technology.DiscussProblems.com site is almost fulfill our requirement i.e what we want tht such site which is based on review or some what like it. This is same kind of site means here anonymous user post or share their problem with out giving his/her identity and other viewer give their better solution. So from there are number of categories are available for posting the problem and sharing their solution

VIII. Conclusion And Future Work

In this paper, we describe a novel approach for opinion extraction using Natural language processing and identify whether opinion is good ,bad or if it abuse type then it will automatically removed. Future work for this approach is its implementation for the various web sites which is based on review type or opinion based.

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REFERENCES

[1] Mozenda Web Scraper - Web Data Extraction http://www.youtube.com/watch?v=gvWGSBRuZ5E
[2] Natural Language Processing http://en.wikipedia.org/wiki/Natural_language_processing
[3] Natural Language Processing 68 www.hit.ac.il/staff/leonidm/information-system/ch-68.html
[4] Natural Language Processing http://www.seogrep.com/natural-language-processing/
[5] Yuequn Li, Wenji Mao1, Daniel Zeng, Luwen Huangfu1 and Chunyang Liu A Brief Survey of Web Data Extraction Tools
[6] Mary D. Taffet Application of Natural Language Processing Techniques to Enhance Web-Based Retrieval of Genealogical Data
[7] PARAG M.JOSHI, SAM LIU. Web Document Text and Images Extraction using DOM Analysis and Natural Language Processing. To be published in the 9th ACM Symposium on Document Engineering, DocEng'09, Munich, and Germany. September 16-18, 2009
[8] Jagadish S KALLIMANI, Srinivasa , Information Extraction by an Abstractive Text Summarization for an Indian Regional Language
[9] Yuequn Li, Wenji Mao, Daniel Zeng, Luwen Huangfu1 and Chunyang Liu, Extracting Opinion Explanations from Chinese Online Reviews
[10] Foram Joshi Extracting Opinion From Web Sites Using Natural Language Processing, 9th National Confererence On Information, Knowledge & Research In Engineering, Technology & Sciences 2013 ISBN: 978-81-906220-9-7
[11] Foram Joshi A Comparative Approach For Data Extraction From Web Sites Using Natural Language Processing International Conference On Advanced Computer Science And Information Technology (ICACSIT) GOA- ISBN: 978-81-925751-5-5

Current Routing Strategies to Adapt the Characteristics

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ABSTRACT:
The VANET characteristics including high-speed node movement, frequent topology change, and short connection lifetime especially with multi-hop paths. These three characteristics degrade the performance of some popular topological routing protocols for ad hoc network significantly. This is because topological routing needs to maintain a path from the source to the destination, but the path expires quickly due to frequent topology changes. The frequently changed topology suggests that a local routing scheme without the need to keep track of global routing information scales better in VANET. In addition, the popularity of GPS also makes position-based routing, which maintains only local information about the node's position, a popular routing strategy. A successful VANET routing solution also needs to handle issues such as sparse network density, interfering environment, long path length, latency etc. In this Paper, we look at the current routing proposals that address the characteristics of VANET. We select the routing strategies designed and tested on VANET simulation and categorize them into (1) position-based, (2) enhanced topological-based, and hybrid approach.

Position-based Routing

Position-based routing usually performs well in a highway environment in which nodes are moving quickly and transmission area has few obstructions.

Cluster Based Location Routing (CBLR)[22]:

This algorithm assumes all vehicles can gather their positions via GPS. The algorithm divides the network into multiple clusters. Each cluster has a cluster-head and a group of members within the transmission range of the cluster-head. The cluster-head and members are formed as follow:

1. A new vehicle transmits a Hello Message.
2. If the vehicle gets a reply from the cluster-head vehicle, the new vehicle would become a member of the cluster. If not, the new vehicle becomes the cluster head.
3. The cluster-head is responsible to send a message every second to let the members know its existence.

To reduce message flooding in the global networks, members of the cluster transmit packets to the cluster-head only and the cluster-head is responsible to forward message to other clusters. The cluster head knows the routing information within the cluster. Between the cluster-heads, at least one bridge node is needed to take care of the communication between the cluster-heads. A cluster-head must at least know one bridge node, so the packet can be send outside the cluster. The cluster-head then send message to a bridge node. The bridge node would transmit the message to another cluster-head. The chapter gives examples on how to recover from the loss of member, cluster-head, or bridge node. Simulation was used to verify the algorithm. The authors indicate that the simulations assume that transmission of packet is synchronized, which would not be the case in a real scenario. The test results show that the algorithm shows good performance when the speed of vehicles is less then 89 miles per hour (30 m/s). The end-to-end delay is 8 msec on average.

Enhanced Topological-based Routing

As mentioned, topological-based routing is believed to be less scalable in VANET environments. Suetal propose an algorithm to predict the future state of network topology and perform route reconstruction proactively . Their goal is to address the problems of rapid topological changes by reconstructing a usable route rapidly. The basic idea is that connection time can be approximated if the velocities of two nodes, distance, and transmission ranges are known. The proposed equation finds the amount of time two mobile hosts will state connected using the velocity differences, moving directions, transmission range and the current distance at a given time.

Hybrid Approach

The Hybrid approach makes use of node position information and also information on the paths from the source to the destination. The algorithms with this approach usually assumes every vehicle not only has an on board GPS but also have the digital maps ready in storage. This may not be realistic during the early deployment of VANET. However, there exists location-identifying scheme without GPS or digital maps .

Lochertetal algorithm :

Lochert contributes in two areas in this chapter:
(1) their simulation model consider the effects of obstructions in vehicular ad hoc network,
(2) they propose a routing strategy for a city environment.

A microscopic simulator Videlio, developed by DaimlerChrysler AG is used to simulate the traffic flow. A small part of the city of Berlin was modeled as a graph of streets and movement of 955 vehicles are simulated. The city obstruction is achieved by extending the simulator to consider the spaces between streets as buildings. As a result, two nodes can only communicate directly when they are in their respective transmission range and also they are within the 'line of sight' of each other. The network model is simulated using NS-2.

They propose Geographic Source Routing (GSR), which combines position and topological information in routing decision. The scheme requires an on board GPS system that contains the digital maps of current areas. The sender computes a sequence of junctions the packet has to traverse to reach the destination using the underlying map of the streets. The current implementation selects the path between source and destination by a Dijkstra's shortest path calculation based on the street map. The simulation shows GSR outperforms the topological-based algorithms, DSR and AODV, with respect to delivery rate and latency.

Cheng et al algorithm:

This algorithm is very similar to Lochert's algorithm above. It combines the knowledge of position and topology information from digital maps to construct a shortest route from source to the destination. Other than providing an algorithm from a source to one destination node, it enhances the algorithm to route to a destination area.

Tian et al algorithm:

Like the above two algorithms presented in this category, this algorithm makes use of static digital map data to construct a path from the source to the destination instead of maintaining global link information. In addition, the authors point out a situation in which a forwarding vehicle may never find a suitable neighbor because the path information is based on static map data instead of existing links. They propose three ways to recover from this situation: (1) buffer the packets and retry a number of times, (2) switch to greedy forwarding, (3) compute another path using the static map.

DIRECTION OF FUTURE RESEARCH

This section suggests some directions of future research for VANET in general. As seen in some of the studies presented, the transmission range of a vehicle may be too strong or too weak during certain times of the day and in certain city environments. When the transmission is too strong, it creates interference and lowers the system throughput. When transmission is too low, the vehicle cannot reach other vehicles. Smart algorithms that adjust the transmission range according to external factors can help finding the balanced transmission range. Further research is needed to provide these smart algorithms based on the characteristics of vehicular networks. Increasing body of research makes use of GPS data in the routing proposals. The routing proposals often assume that either all nodes have GPS or none has GPS. The most realistic situation is that some nodes have GPS and some do not. We believe more works is needed to address the mixed environment. Current studies in characterization of VANET focus mostly on a simulated highway environment. Vehicle characterization in city and other environments is less studied. Also, most of the characterization study is done with simulation. Actual field experiments to study the characterization on the vehicles moving in highways with actual network layers are potential future works. Programs and tools that can perform automatic communication and data collection in these field experiments are also valuable. Increasing number of users owns varied kind of wireless equipments that make use of varied kind of wireless technology and protocols. Commercial vendors are adapting new wireless protocols quickly while consumers are still making use of older technologies.

For example, a cellular phone may be running Bluetooth, a PDA running Wireless LAN 802.11a and the laptop using Wireless LAN 802.11b and the vehicle is potentially using yet another slightly different protocol. A mixture of old and new wireless technologies and equipments are likely to be used by the consumers. A vehicular ad hoc network that can connect these equipments and technologies together seamlessly will change the way we travel. For example, a passenger can make a telephony phone call via IP using her PDA through the vehicular ad hoc network. The routing solutions need to take care of the forwarding of different kinds of packets and routing protocols in such network. Several studies have focused on understanding time critical safety application. The characterization of VANET indicates that delay-tolerant applications can perform well. Exploring delay tolerant application in the VANET space and the routing implication are future research topics.

Energy Based Routing Protocol for Wireless Sensor Networks

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ABSTRACT:
The main aim of the project carried is to provide an efficient routing mechanism that helps in data transmission in wireless network. The project is combination of mainly two algorithms, LEACH-c algorithm: it selects the cluster head by the base station. DCHS: it is also used to select cluster head by considering both factor of energy and factor of threshold. With the deployment of both algorithms it maximize network lifetime in wireless sensor networks, the paths for data transfer are selected in such a way that the total energy consumed along the path is minimized. It also helps to solve issues like load imbalance, signal interference and reduce time delay.

Keywords- *Base station, Cluster Head, DCHS, Leach-c, WSN.*

I. INTRODUCTION

In wireless sensor networks there are large number of sensor nodes involved in the communication. The data that has to be transferred has to travel through various nodes due to which there is a chance of data loss or may get corrupted. As data transfer in the WSN is in haphazard manner so when data is transferred from source to destination it travel through various nodes randomly due to which the consumption of energy is huge and other issues may also rise.

LEACH is well known algorithm for the WSN's because it considers groups and cluster heads for transmission of data. The cluster heads are selected in rounds randomly. LEACH algorithm Data transmission is the major consumer of power, so it is important to have power-efficient protocols. In order to reduce the total power consumption in the network LEACH uses cluster heads in rounds for transmission to long distances. Hence an algorithm is needed which is more efficient than LEACH which has better energy efficiency.

As WSN is based on the concept of clustering and this concept has become the area of research. In my paper I have considered two algorithms to form cluster in WSN. The LEACH-c which is the form of centralized algorithm is been used to form cluster and to select a cluster head, so that nodes in a particular cluster will have a prior information of node they have to transfer data. The DCHS which is the form of distributed algorithm only requires cluster heads rotation to prevent the cluster head failure. Cluster heads rotation of each cluster don't need to complete in the same time and exchange information with each other until some heads in clusters runs out of energy.

II. PROPOSED SCHEME

In the current approach Gradient-Based Routing (GBR), while being flooded, the 'interest' message records the number of hops taken. This allows a node to discover the minimum number of hops to the user, called the node's height. The difference between a node's height and that of its neighbor is considered the gradient on that link. A packet is forwarded on the link with the largest gradient. Hence by using Gradient minimum number of hops route is found out. Secondly while maximizing the network lifetime is clearly a useful goal, it is not immediately obvious how to reach this goal using observable parameters of an actual network. As the finite energy supply in nodes' batteries is the limiting factor to network lifetime, it stands to reason to use information about battery status in routing decisions. Hence battery optimization is achieved. The concept of shortest path is used find the route which is shortest path. So in order to reduce total power consumption in the network a combined algorithm considers energy efficiency and threshold both to have a cluster head.

The proposed solution has following steps.

1. All the nodes present in the network have to send their information to the base station.
2. Base station based on the information divides nodes into various clusters and also selects respective cluster head.
3. Cluster head selection is carried out within the cluster, in this process it selects cluster using distributed algorithm.
4. Access the node energy levels after its involvement in transfer of data.
5. Cluster head rotation to prevent the cluster head failure.

The first two steps fall under LEACH-C algorithm and remaining fall under DCHS algorithm. So the two processes run alternatively which helps in resolving the issue of load imbalance.

III. LEACH-C ALGORITHM

LEACH-C organizes the sensor nodes into clusters with each cluster a cluster head and divides a round into set-up and steady-state phases. It uses a high-energy base station to finish the choice of cluster heads. In the set-up phase of each round, every sensor node sends its information about energy to remote BS. Then the BS selects the cluster heads based on the energy information and broadcasts the IDs of cluster heads to other member nodes. This method can make the nodes with more energy and more chance to become the cluster head in the current round. But in this phase, every sensor node needs to send its ID and energy information to remote BS to compete for the role of cluster heads, which causes energy consumption on the long distance transition. We can obtain that there will be a certain amount of energy needed to be spent on the transition of energy information for each sensor node in every round, which cannot be neglected in communication; especially the BS locates far away from the monitor field and the network has a lot of sensor nodes.

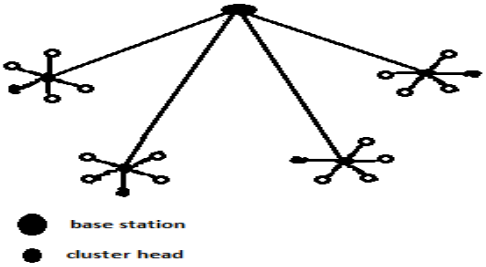

Figure 1: LEACH-c Algorithm

IV. DCHS ALGORITHM

DCHS is a distributed process for selection of cluster head. It selects the cluster head based on energy and threshold value of a node. As in this project the main emphasize is on reduction of energy utilization of nodes, so it require to contentiously change the cluster head in a particular cluster as in cluster head more energy is utilized while sending or receiving of data as compare to other nodes present in the cluster. If the energy of most of the nodes present in the cluster is lesser then the threshold level it sends the information to the base station where the processes starts again. The nodes in cluster communicate with each other and select the node with highest energy, this way the cluster head is again selected within the node. The diagram is as shown below in figure 2.

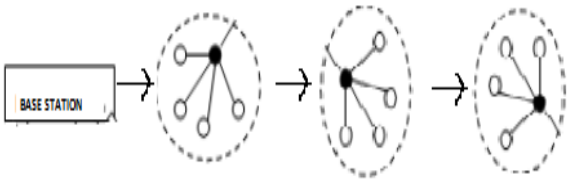

Figure 2 .DCHS ALGORITHM

V. AGGREGATED ALGORITHM

This process is aggregation of both the algorithms discussed above. First it runs out the LEACH-c algorithm and waits until it goes into stable phase after that it starts second process. The process of changeover from one process to other does not hold much complexity. Once the base station gets the information of energy about all the nodes, it selects the set of heads called as cluster heads and then sends the information of heads to other nodes. Node decides which cluster to join order by LEACH-c, and then nodes go into stable phase. Once any head has energy problem, the first process is over.

During second process every cluster changes their own head in house when the head energy becomes low then the threshold value. The nodes in cluster communicate with each other and select the node with highest energy, this way the cluster head is again selected within the node Nodes need not send message to base station. After the second process last for a long period of time, Current energy of each node is very low, and the threshold T (n) is also smaller. Probability that nodes becoming head will greatly reduce. Many nodes go into dead state because of the shortage of energy. For these reasons, cluster needs to be rebuilt. Therefore second process is over, and nodes sent message to base station. Flow is shown in Figure 3.

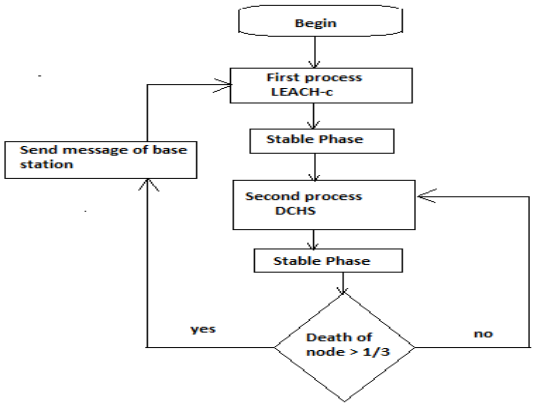

Figure 3 .Aggregated Algorithm

VI. SYSTEM ARCHITECTURE

In the system architecture there are two parts one is base station and the other one is node. The base station consist of three modules internally life time analyzer, Leach-c clustering engine and event collection. Both these modules work simultaneously to meet the objective. The input for clustering engine is current energy value which is generated by the energy monitor present in the second (node) module. The energy monitor monitors the energy by getting updates after every event caused and the involvement of the particular node. The event collection is also maintained at the station side which keeps track of every single event happened.

Once the cluster formation is done with the help of LEACH-c algorithm it passes the output to DCHS algorithm for further processing that is for the selection of the cluster head and continues the process. The life time analyzer is used to analyze the life of the each and every node. As the node reduces it energy once it undergoes any event, finally a stage will come where the node will not be having any energy it is called as dead state and the replacement is require for that to continue the routing process. The diagram is as shown in below figure 4.

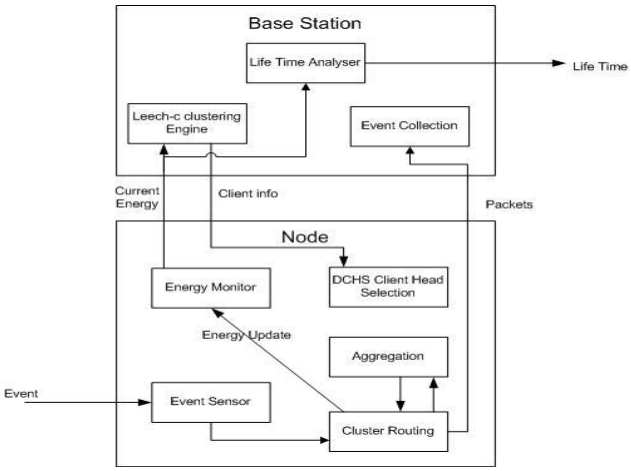

Figure 4 .System Architecture

Combined algorithm compared with other algorithms:

Combined algorithm compare with other algorithm in some areas, such as balance, robustness and soon. Studies have shown that combined algorithm use of the advantages of the other two algorithms efficiently and make up their shortage. But the performance of the algorithm is poor, because algorithm cannot find the best time to rotate.

Comparison of various algorithms is shown in table 1.

Protocol	CH-selection	Formation	Maintenanc	Robustness	Balance
LEACH	Fast	Fast	High	Moderate	Poor
DCHS	Fast	Very Fast	High	Moderate	Poor
LEACH-c	Slow	Slow	High	Good	Good
AGGREGATED	Slow	Fast	High	Good	Good

VII. CONCLUSION

Distributed algorithm (such as DCHS) and centralized algorithm (such as LEACH-C) are analyzed. Comparing two algorithms, a new algorithm being developed. Comparison and simulation results show that the combination of these two algorithms effectively balance network load, save energy, and enhance network scalability. The combined algorithm effectively improves the performance of WSN, including the overall balance, energy consumption, and the distribution of nodes and so on.

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Last but not the least I would like to thank my parents and friends who have always supported me in every path of my life.

REFERENCES:

[1] Song, Bing. Wireless sensor network technology and application [M]. Beijing: Electronic Industry Press.2007.

[2] Heinzelman W, Chandrakasan A, Balakrishnan H. Energy-Efficient communication protocol for wireless micro sensor networks. In: Proc.of the 33rd Annual Hawaii Int' l Conf. on System Sciences. Maui: IEEE Computer Society, 2000. 3005_ 3 014.

[3] Handy MJ, Haase M, Timmermann D. Low energy adaptive clustering hierarchy with deterministic cluster-head selection. In:Proc. of the 4th IEEE Conf. on Mobile and Wireless Communications networks. Stockholm: IEEE Communications Society, 2002. 368_ 3 72

[4] Vinay Kumar, Sanjeev Jain, Energy Efficient clustering algorithms in wireless sensor networks. IJCSI International journal of computer science Issues, Vol.8, Issue 5, No 2, September 2011.

Cfd Analysis of Convergent- Divergent Supersonic Nozzle

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***ABSTRACT*:**
In the present work, CFD analysis of flow within, Convergent–Divergent rectangular supersonic nozzle and supersonic impulse turbine with partial admission have been performed. The analysis has been performed according to shape of a supersonic nozzle and length of axial clearance, with an objective of investigating the effect of nozzle-rotor interaction on turbine's performance. It is found that nozzle-rotor interaction losses are largely dependent on axial clearance which affects the flow with in nozzle and the extent of flow expansion. Therefore nozzle-rotor interaction losses can be decreased by selecting appropriate length of axial clearance.
The present work has been carried out in two stages: Part 1 consists of modeling and analysis of flow for rectangular convergent divergent supersonic nozzle. Part 2 of the work is on prediction of optimal axial gap between the Nozzle and rotor blades by allowing the above nozzle flow. In the present study, flow through the convergent divergent nozzle study is carried out by using a finite volume commercial code, FLUENT 6.2. The nozzle geometry modeling and grid generation has been done using GAMBIT 2.3 Software. Computational results are in good agreement with the experimental results taken from the literature.
Keywords— *CFD, Modelling, Fluent, Gambit*

I. INTRODUCTION AND LITERATURE REVIEW

Many commercial software packages are being used in the design as well as analysis processes which not only save lead time and costs of new designs, but also are used to study systems where controlled experiments are difficult or impossible to perform. In the area of fluid dynamics, there are many commercial computational fluid dynamics (CFD) packages available for modeling flow in or around objects. Combined with the use of wind tunnel test data, CFD can be used in the design process to drive geometry change instead of being used mainly as a design validation tool. One of the most critical requirements for any CFD tool used for thermal applications is the ability to simulate flows along nozzles, turbines. Such challenging features as pressure gradients, shocks, velocity distribution, eddy location, stream line curvature, and stream wise vortices pose a challenge for computation. The small margins of improvement that are usually targeted in nozzle and turbines design today require precise tools capable of discerning small differences between alternative designs. Custom modelling tools that are based as simplified numerical methods and assumptions cannot provide the accuracy that can be obtained with CFD, which offers mainly inherent advantages for e.g.: it offers quick and cheap solutions in comparison to experimental solutions and more accurate in comparison to empirical methods used in design. Accurate simulation of flows through the nozzle is important for prediction of velocity pattern and pressure patterns.

Shin et *al.* [1] analyzed flow within supersonic impulse turbine with partial admission and concluded that turbine performance is depending upon the shape of nozzle, shape of rotor blades, and exile gap. Khan and Shenbharkar [2] in their paper opinions that one-dimensional in viscid theory does not reveal the complex flow features in a choked CD nozzle accurately. The code fluent has been used to compute RANS flow in a 2-D CD nozzle for nozzle pressure ratios (NPR) corresponding to presence of shock inside the diverging part of the nozzle. The computed solutions differ from the simple theory so for as shock location, shock structure and after – shocks are concerned. Majumdar and Rajani [3] evaluated grid generation for arbitrary 3-D configuration using a differential algebraic hybrid method. Layton and Sahin [4] developed problem solving approach using large Eddy simulation solver (LES) for flow over a back step.

Philip et *al.* [5] conducted a Quasi three-dimensional rotor/stator analysis for blade – to – blade flows in turbo machinery. The Bald winb lomox eddy-viscosity model is used for turbulent flows. B.Jodoin[6], conducted an extensive analytical study of the nozzle geometry, based on the one dimensional flow model to determine the optimal nozzle shape given the conditions, powder properties, and nozzle length. It was shown that the spray particle velocity is relatively insensitive to the nozzle shape and therefore that a single nozzle can be used for variety of operating conditions, as long as no shock waves are present in the nozzle.

The current study aims analysis of flow through the nozzle and prediction of optimal axial clearance. Solutions of flow along the nozzle involve only one phase of gas. Results are verified with the experimental data. In the present work nozzle study has been carried out and by using same nozzle, axial gap (clearance determination) has also been analysed.

METHODOLOGY AND MODELLING

To resolve a turbulent flow by **direct numerical simulation** requires that all relevant length scales be resolved from the smallest eddies to scales on order of the physical dimensions of problem domain. To get statistical quantities of interest, which cannot be measured experimentally, can be evaluated from the simulations (**dalea Anderson**). DNS is used for developing an understanding of the physics of the flow and deployed in developing turbulence models for simple flows. However, from an engineering point of view, It provides for more information than an engineer needs, and it is simply too expensive to be employed on a regular basis.Most engineering flows of interest are in the turbulence regime, which contain a wide range of length and times scales. In **large eddy simulation** the large eddies are computed and the smallest eddies are modeled, as the large –scale motions are more energetic than the small scale and are responsible for most of the important.

The small scale turbulence serves mainly to drain energy from the large scales through the cascade process, and is more universal land nearly isotropic, which makes it more suitable to be modeled the computational effort required for les is less than that of DNS by approximately a factor of 10 using present methods.The main thrust of present day research in computational fluid dynamics in turbulent flows is through the time-averaged Navier Stokes equations. These equations are referred to as the Reynolds equations of motion or the Reynolds averaged Navier Stokes (RANS) equations. Time averaging the equations of motion give rise to new terms, which can be interpreted as' apparent" stress gradients associated with the turbulent motion. These new quantities must be related to the mean flow variables through turbulence models.

The Reynolds equations are derived by decomposing the dependent variables in the conservation equations into time mean (obtained over an appropriate time interval) and fluctuating components and then time averaging the entire equation.The model development is carried out on gambit. It is the pre processing process where the model development is done and meshing of model is followed for further analysis. GAMBIT is a software package designed to help analysts and designers build and mesh models for computational fluid dynamics (CFD) and other scientific applications. GAMBIT receives user input by means of its graphical user interface (GUI). The GAMBIT GUI makes the basic steps of building, meshing and assigning zone types to a model simple and intuitive, yet it is versatile enough to accommodate a wide range of modeling applications.

The various components of the turbine are designed using GAMBIT. The various components include for present analysis is C-D nozzle and series of three blades of rotor. The component nozzle is modeled individually, the combined assembly of nozzle and blade modeling have been carried separately. The profiles are generated with the help of coordinates available which have been generated. All these components are modeled and meshing is done separately.

1.1 Modeling of the Super Sonic Nozzle:

The coordinates are provided in Table [1.1],[1.2],[1.3]for development of the 3D model of the supersonic nozzle. The profile of the nozzle has been shown in Fig. 1.1. For design purpose, the nozzle can be seen as an assembly of three separate sections operating in series a converging section, a throat, and finally the diverging section. In present analysis rectangular nozzle which stacks up 2-D supersonic nozzle profile in normal direction as shown in figure [5.4].Different models of nozzle can be observed in figures[5.2]&[5.3]

Sl.No.	X (mm)	Y (mm)
1	4.000	0.000
2	5.000	1.000
3	5.000	2.854
4	6.810	9.191
5	14.639	17.129
6	25.915	23.387
7	37.497	27.252
8	54.685	32.100
9	78.997	32.100
10	63.282	28.688
11	38.482	23.303
12	29.197	19.638
13	23.628	15.216
14	21.553	11.526
15	20.525	5.000
16	20.525	1.000
17	21.525	1.000

TABLE 1.1: Coordinates For End Points Of Nozzle Profile

CENTERS	X (mm)	Y(mm)	RADIUS (mm)
C1	4.000	1.000	1.000
C2	17.000	2.854	12.000
C3	31.531	-7.360	29.750
C4	48.045	-29.780	57.589
C5	56.123	-47.842	77.370
C6	-47.118	-12.171	36.510
C7	39.334	1.158	21.079
C8	30.695	8.812	9.536
C9	50.985	2.284	38.556
C10	21.525	1.000	1.000

TABLE 1.2: Coordinates For Arc Centers

SL.No.	X (mm)	Y (mm)	Z (mm)
1	0	0	0
2	0	32.1	0
3	90	32.1	0
4	90	0	0
5	0	0	22
6	0	32.1	22
7	90	32.1	22
8	90	0	22

TABLE 1.3: Coordinates for block on which nozzle profile is cut for 7.1 mm depth

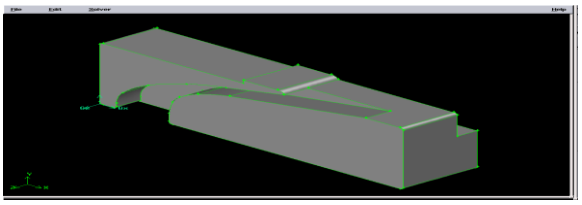

Fig. 1.1 Nozzle Profile

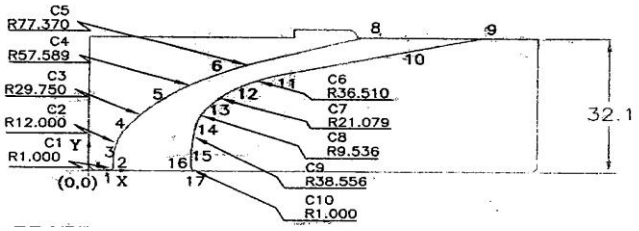

Fig. 1.2: Solid Model of Nozzle Profile Made on a Block.

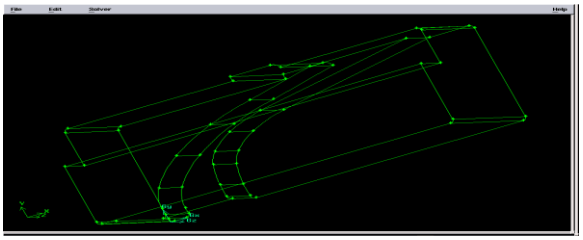

Fig. 1.3: Wire Frame Model of Nozzle Profile Made on a Block.

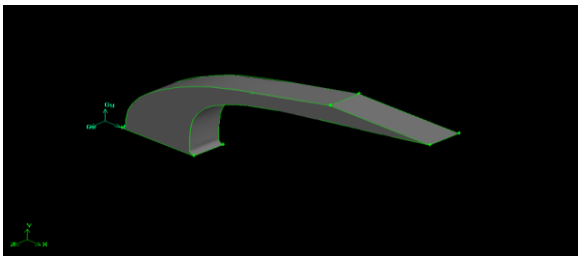

Fig. 1.4: Solid Model of nozzle Profile.

1.2 Modeling of the Blade Profile

The 2D model of blade profile is as shown in figure [1.5].Modeling of blade 2D is carried out by the coordinates provided table [1.4],[1.5]. A series of three blades is shown in figure[1.6] on which nozzle flow will impinges.

S.No.	*X (mm)*	*Z (mm)*
1	2.285	1.440
2	4.657	3.419
3	6.064	5.373
4	6.248	5.309
5	4.699	1.385
6	3.427	-1.235
7	2.960	-2.023
8	2.491	-2.636
9	2.017	-3.059
10	1.063	-3.604
11	-0.383	-3.730
12	-1.356	-3.373
13	-2.337	-2.373
14	-3.331	-1.249
15	-4.343	0.944
16	-5.744	5.119
17	-5.582	5.212
18	-5.021	4.516
19	-3.538	2.844
20	-0.362	1.039

TABLE5.4: Arc End Co-Ordinates

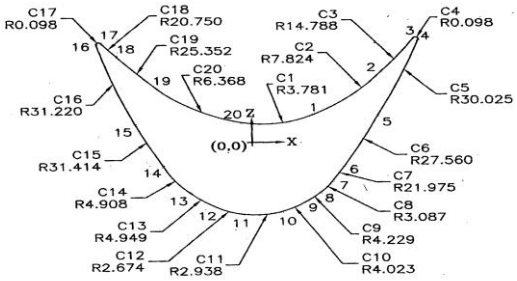

Fig. 1.5: Blade Profile.

CENTERS	X(mm)	Z (mm)	RADIUS (mm)
C1	0.432	4.736	3.781
C2	-1.443	8.319	7.824
C3	-6.601	13.009	14.788
C4	6.153	5.331	0.098
C5	-22.385	14.346	30.025
C6	-20.693	12.099	27.560
C7	-15.716	9.556	21.975
C8	0.295	-0.467	3.087
C9	-0.437	0.129	4.229
C10	-0.437	0.129	4.023
C11	0.093	-0.831	2.938
C12	0.032	-1.088	2.674
C13	1.119	0.912	4.949
C14	1.089	0.884	4.908
C15	24.666	12.998	31.414
C16	24.481	12.941	31.220
C17	-5.651	5.144	0.098
C18	-21.447	-8.162	20.750
C19	14.666	20.489	25.352
C20	1.065	7.245	6.368

TABLE 1.5: Arc Center Coordinates

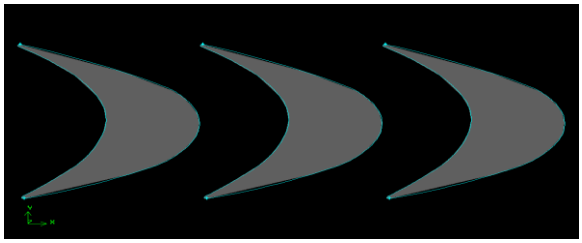

Fig. 1.6: Series of Rotor Blade.

1.3 Modeling of Nozzle and Turbine Blades as Partial Admission Case:

2D modeling of combined nozzle and series of 3 blades in a partial admission turbine rotor is carried out by using the nozzle and blade profile generated data provided in Tables [1.1],[1.2],[1.3],[1.4]and [1.5]. As analysis is to be carried out for different axial gap between rotor blades and nozzle, length of ordinate is fixed. Rotor blades and nozzle with different axial gaps are modeled separately as shown in Figs. [1.7],[1.8] and [1.9] for 3mm,4mm & 5mm axial gaps respectively.

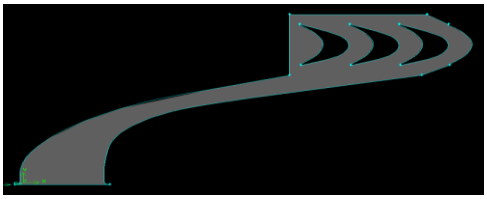

Fig. 1.7: Solid Model as a Partial Admission Case of Nozzle and Rotor Blades with 3mm axial gap.

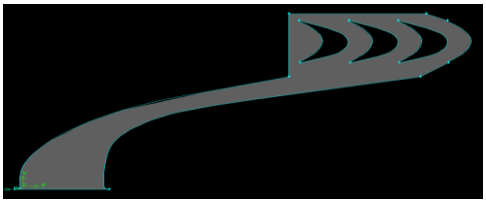

Fig 1.8: Solid Model as A Partial Admission Case of Nozzle and Rotor blades with 4mm axial gap.

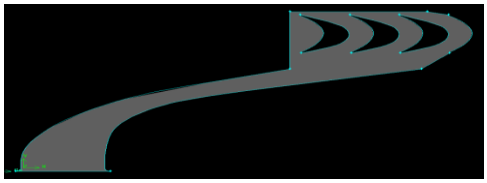

Fig. 1.9: Solid Model as a Partial Admission Case of Nozzle and Rotor Blades with 5mm axial gap.

II. GRID GENERATION AND BOUNDARY CONDITIONS

The first step of the actual work is the geometry creation and then considers a certain domain of the fluid in which the body is present under analysis. Then the volume occupied by the body as well as fluid is divided into discrete cells called meshing Physical modeling is then defined i.e., equations of motion, no. of phases in the flow, turbulence model etc. boundary conditions are defined now. This involves specifying the fluid behavior and properties at the boundaries of the problem. Then the simulation is started and the equations are solved iteratively as steady state or transient. Finally a post processor is used to view the results. These steps are followed for both C-D nozzle and for combined nozzle and rotor blades.

2.1 Mesh Generation for 3D C-D Nozzle

The flow domain is required to be discretized to convert the partial differential equations in to series of algebraic equations. This process is called grid generation. A 3D Model is created in GAMBIT as shown in Fig.1.4. To generate the structured grid as shown in Fig.2.1 with hexahedral cells gambit is used. This mesh are in good agreement with turbulence model gave good results, which otherwise didn't match, with the experimental ones.

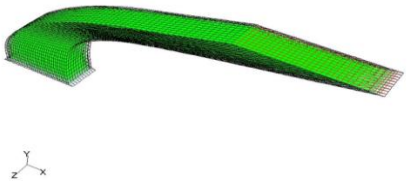

Fig. 2.1 Meshed View of 3 D Nozzle Profile

2.2 Mesh Generation for 2D C-D nozzle

A 2D nozzle profile is modeled in GAMBIT. To generate the structured grid as shown in figure 2.2 with quadrilateral elements Gambit is used. This mesh are in good agreement with turbulence model gave good results, which otherwise didn't match with the experimental ones. Nozzle inlet as pressure inlet and outlet as pressure outlet and remaining as walls the nozzle path are defined as fluid. File is saved for analysis in fluent.

A 2D model of the rotor blades and nozzle for different axial gaps of nozzle exit and turbine rotor blades are modeled in GAMBIT as shown in Figs. 1.7,1.8 and 1.9. To generate the structured grid with triangular elements Gambit is used. This mesh are in good agreement with the different model adopted gave good results, which other wise didn't match with the experimental ones the boundary conditions are defined asgiven. Inlet as pressure inlet and outlet as pressure outlet remaining as walls. Meshed models of a partial admission Case of Nozzle and rotor blades with axial gaps of 3mm, 4mm and 5mm have also been shown in Figs.2.3, 2.4 and 2.5.

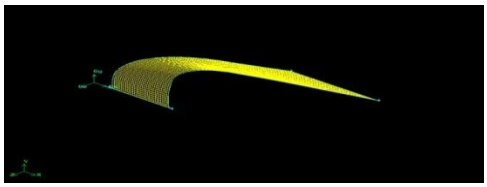

Fig. 2.2 Meshed View of 2 D Nozzle Profile

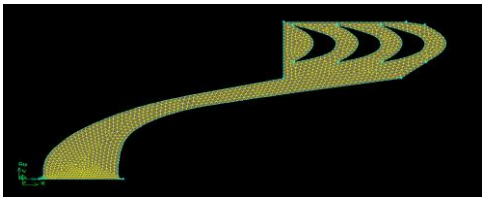

Fig. 2.3: Meshed View as a Partial Admission Case of Nozzle and Rotor Blades With 3mm Axial Gap.

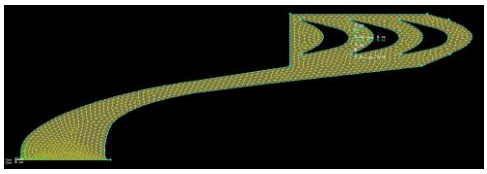

Fig. 2.4 Meshed View as a Partial Admission Case of Nozzle and Rotor Blades With 4mm Axial Gap.

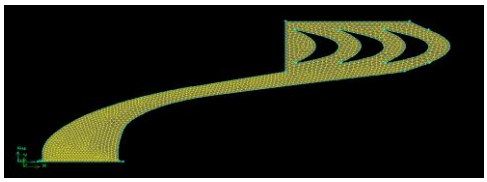

Fig. 2.5 Meshed View as a Partial Admission Case of Nozzle and Rotor Blades With 5mm Axial Gap.

III. ANALYSIS

The analysis is carried in fluent software by importing the meshed file saved in Gambit. The steps that are followed are given below which include all the conditions and the boundaries value for the problem statement.

3.1 Analysis of C-D Rectangular Nozzle

The fluent solver is opened where 2DDP is selected and then the importing of the meshed file is done. The meshed file then undergoes a checking where number of grids are found. Grid check is followed by smoothing and swapping of grid. Following this the scaling is done. Scale is scaled to mm. Grid created was changed to mm. After this defining of various parameters are done. Solver is taken as coupled based and formulation as implicit, space as 2D and time as steady. Velocity formulation as absolute and gradient options as green gauss cell based are taken. Energy equation is taken in to consideration. The viscous medium is also taken. They analysis is carried using K-epsilon turbulence model. Material selected is gas. The properties of gas taken as follows: Cp (Specific heat capacity) = 2034.6J/Kg.K, Thermal Conductivity = 0.0706 W/M-K, Viscosity = 6.07 e^{-5} (Kg/M-S), Molecular weight = 23.05 (Kg/Kg-Mol). The analysis is carried out under operating condition of zero Pascal. Gravity is not taken in to consideration.

Pressure inlet was taken as inlet for nozzle the value of pressure is 8101325 Pascal. Initial gauge pressure was taken as 7898681 Pascal. Temperature was taken as 1583K. The nozzle outlet is set as pressure outlet with a value of $13e^5$. The solution controls are set as listed below: The under relaxation factor was set as given. Turbulence Kinetic Energy as 0.8, Turbulence Dissipation rate 0.8 and Turbulence Viscocity as 1. Discretization Equation is selected as Flow (Second order up wind), Turbulence Kinetic Energy (1st order upwind), Turbulence dissipations rate (1st order upwind). Solution initialization has also been done. Initial values of velocity are taken as 186.3 m/s for y direction. Temperature is taken as 1583K, Residual monitoring is done and convergence criteria are set up. The convergence criteria of various parameters are listed below. Continuity -0.001, X Velocity- 0.001, Y Velocity- 0.001, Energy - 0.001. The number of iterations is set up and iterations starts. The iteration continues till the convergence is reached and convergence history as shown in Fig. 3.1.

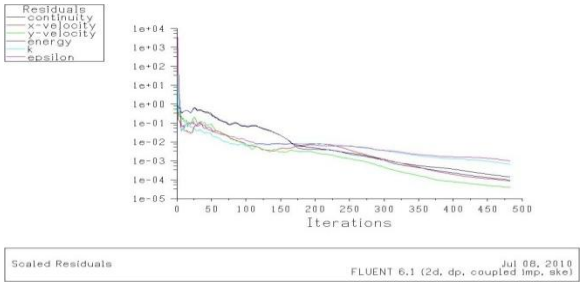

Fig. 3.1 Convergence History for C-D Nozzle.

3.2 Analysis of Nozzle and Turbine Rotor Blades as a Case of Partial Admission

The analysis is carried in fluent by importing the meshed file saved in Gambit. The steps that are followed are given below which include all the conditions and the boundaries value for the problem statement, for varied axial gaps of nozzle and turbine rotor blades as a case of partial admission. The fluent solver is opened where 2DDP is selected and then the importing of the meshed file is done. The meshed file then undergoes a checking where number of grids are found. After this grid check is done following which smoothing and swapping of grid is done.

Following this the scaling is done. Scale is scaled to mm. Grid created was changed to mm. After this defining of various parameters are done. The solver is defined first. Solver is taken as Segregated based and formulation as implicit, space as 2D and time as steady. Velocity formulation as absolute and gradient options as green gauss cell based are taken. Energy equation is taken in to consideration. The viscous medium is also taken. They analysis is carried using K-epsilon turbulence model. The selection of material is done. Material selected is gas. The properties of gas taken as follows: Cp (Specific heat capacity) =2034.6J/Kg.K, Thermal conductivity = 0.0706 W/M-K, Viscosity = 6.07 e^{-5} (Kg/M-S), Molecular weight = 23.05 (Kg/Kg-Mol)

The analysis is carried out under operating condition of zero pascal. Gravity is not taken in to consideration. Pressure inlet was taken as inlet for nozzle the value of pressure is 8101325 Pascal. Initial gauge pressure was taken as 7898681 Pascal. Temperature was taken as 1583K. The outlet is set as pressure outlet with a value of 101325 Pascal. The solution controls are set as listed below: The under relaxation factor was set as given. Pressure -0.3, Density-1, Body forces -1, Momentum -0.7, Pressure velocity coupling was taken as Simple Pressure-standard, Density -1st order upwind, Momentum-1st order upwind, Turbulence Kinetic Energy (1st order upwind), Turbulence dissipations rate (1st order upwind), Energy -1st order upwind.
Solution initialization has also been done. Initial values of velocity are taken as 186.3 m/s for y direction. Temperature is taken as 1583K. Residual monitorization is done and convergence criteria are set up. The convergence criteria of various parameters are listed below.

Continuity -0.001, X Velocity-0.001, Y Velocity-0.001, Energy -0.001. The iteration continues till the convergence is reached and convergence history has been shown in Figs. 3.2, 3.3 and 3.4 respectively for 3mm,4mm & 5mm axial gaps of nozzle and turbine rotor blades as a case of partial admission.

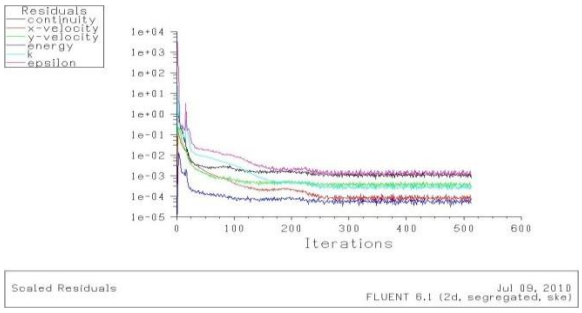

Fig 3.2 Convergence history as a Partial admission case of nozzle and rotor blades with 3mm axial gap.

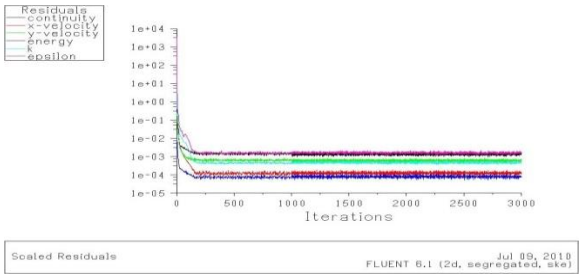

Fig. 3.3: Convergence history as a Partial admission case of Nozzle and rotor blades with 4mm axial gap.

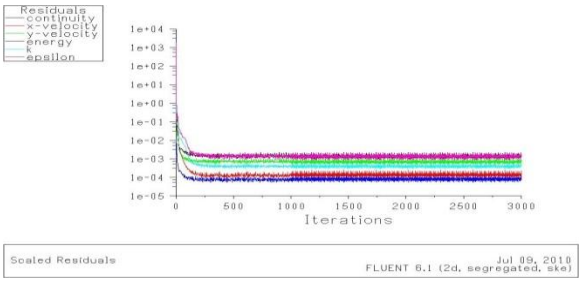

Fig. 3.4: Convergence history as a Partial admission case of Nozzle and rotor blades with 5mm axial gap.

IV. RESULTS AND DISCUSSION

Nozzle profile which is examined in 2D is as shown in Fig. 1.1. Results shown in normal direction is nothing but 3D flow through the nozzle for given input condition with velocity as 183 m/s and maximum output was observed as a 1436 m/s, such that Mach Number is increased from 0.2 to 1.54 in which nozzle is acting as supersonic nozzle and contours of mach number as shown in Fig. 4.1. The velocity contours of nozzle are plotted in Fig. 4.2, the pressure contours of nozzle is plotted in Fig.4.3, and temperature contours of nozzle are plotted in figure4.4. The velocity, temperature, Mach number, pressure variation along the nozzle is compared with theoretical calculation and with experimental results obtained from the literature.

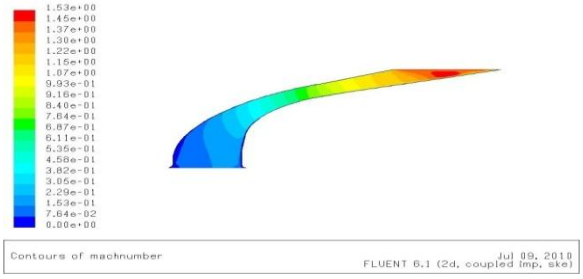

Fig. 4.1: Mach number contours of nozzle.

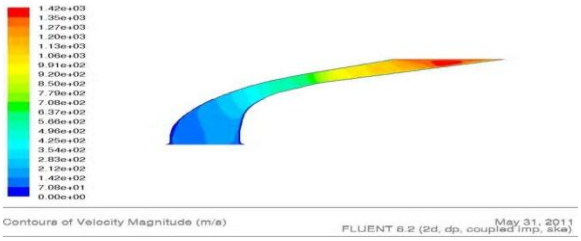

Fig. 4.2: Velocity Contours of Nozzle.

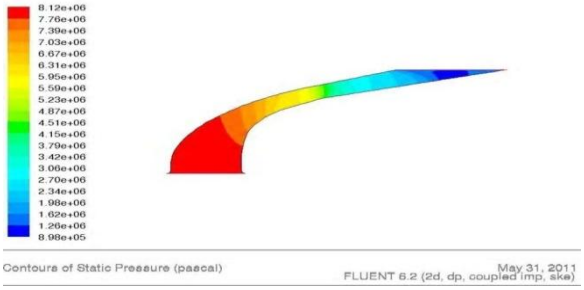

Fig. 4.3: Pressure Contours of Nozzle.

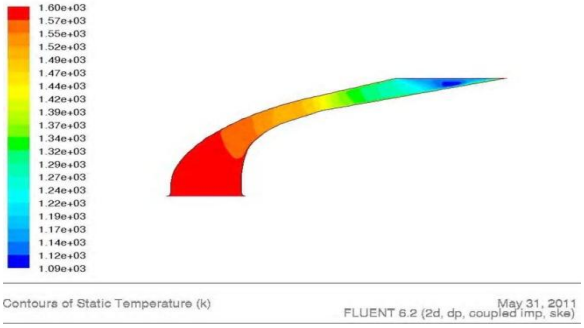

Fig. 4.4: Temperature Contours of Nozzle.

Flow passage form exit of nozzle and entry of turbine rotor blades is allowed under static condition of rotor (blades). As a case of partial admission of axial impulse turbine the flow will suddenly impact to the blades during the of nozzle flow at rotor blades so many factors can be considered to improve the performance of turbine. In this study the tangential velocity is selected as a parameter for better performance of turbine speed. Velocity distribution is as shown in Figs 4.5, 4.6 and 4.7 respectively for 3mm,4 mm and 5mm axial gap respectively. Velocity vector contours are shown in Figs. 4.8, 4.9 and 4.10 respectively for 3mm,4mm and 5mm axial gap respectively. Tangential velocity contours for 3mm, 4mm, 5mm gap axial clearances of nozzle and turbine rotor blades are shown in Figs. 4.11, 4.12, 4.13, 4.14, 4.15and 4.16. The maximum average tangential velocity will act at 3mm axial clearance and hence it can be deduced that 3mm gap of axial clearance will be the better one.

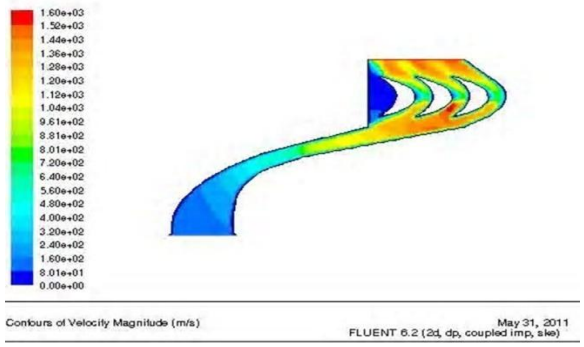

Fig. 4.5: Velocity Contours With 3mm Axial Gap Between Nozzle and Rotor blades.

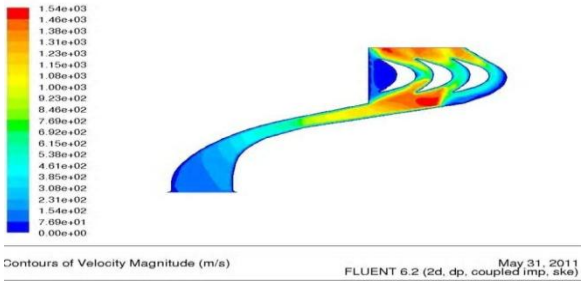

Fig. 4.6: Velocity Contours With 4mm Axial Gap Between Nozzle and rotor blades.

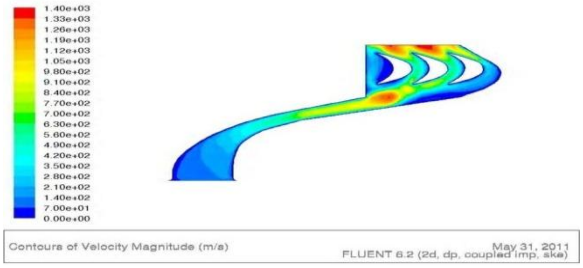

Fig. 4.7: Velocity contours with 5mm axial gap between nozzle and rotor blades.

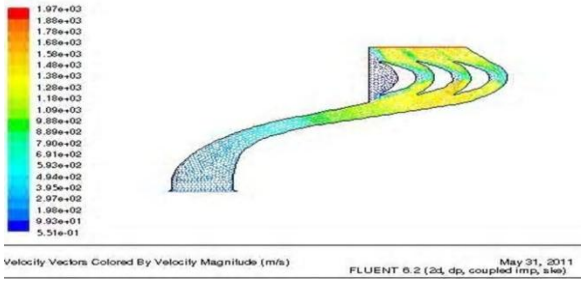

Fig 4.8 Velocity vectors with 3mm Axial gap between Nozzle and Rotor blades.

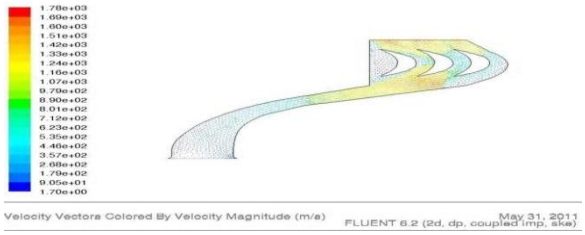

Fig. 4.9: Velocity vectors with 4mm Axial gap between Nozzle and Rotor blades.

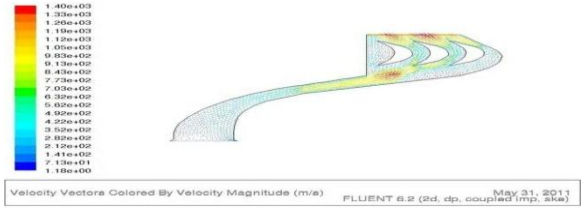

Fig. 4.10: Velocity vectors with 5mm Axial gap between Nozzle and Rotor blades.

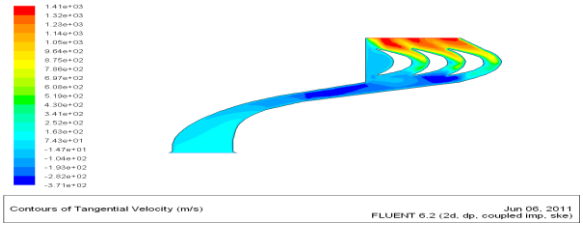

Fig. 4.11: Tangential velocity contours with 3mm axial gap between Nozzle and Rotor blades.

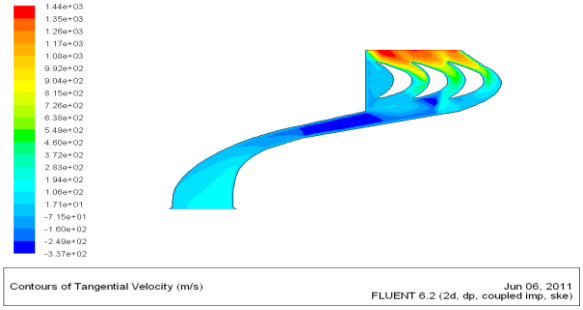

Fig. 4.12: Tangential velocity contours with 4mm axial gap between Nozzle and Rotor blades.

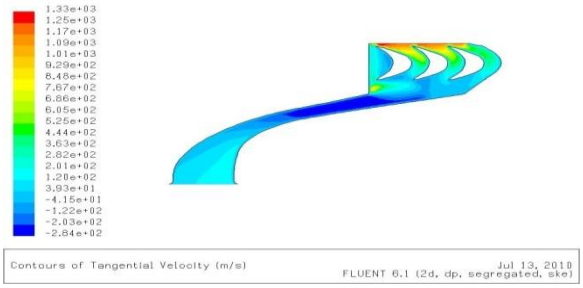

Fig. 4.13 Tangential velocity contours with 5mm axial gap between Nozzle and Rotor blades.

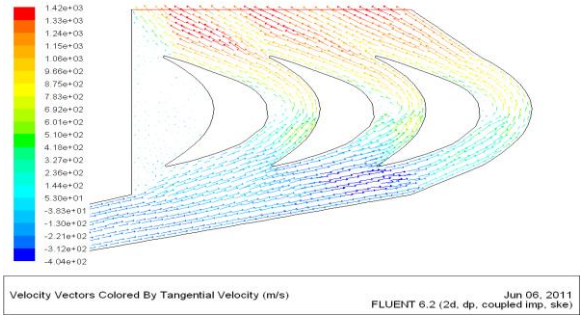

Fig. 4.14: Tangential velocity vectors with 3mm Axial gap between Nozzle and Rotor blades.

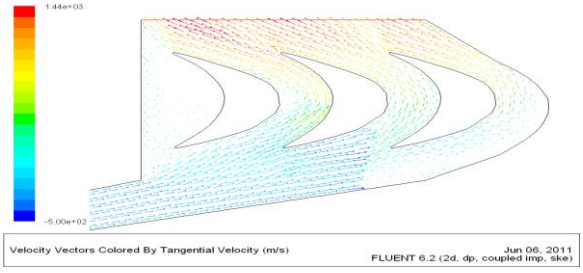

Fig. 4.15: Tangential velocity vectors with 4mm Axial gap between Nozzle and Rotor blades.

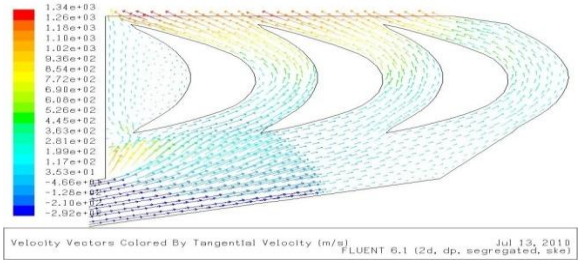

Fig. 4.16 Tangential velocity vectors with 5mm axial gap between Nozzle and Rotor blades.

V. LIMITATIONS

- CD Nozzle flow is carried out for given pressure ratios and input, output conditions as specified.
- The above nozzle used for this purpose is a special type manufactured by Naval Science and Technological Laboratory, Visakhapatnam, India for their special applications.
- During the study of nozzle and turbine the flow of gases is assumed at full length and turbine blades are assumed to be under static condition.

VI. CONCLUSIONS

- CFD results of convergent divergent nozzle were in good agreement with the experimental values and theoretical values and the nozzle is acting as a supersonic nozzle.
- CFD predictions for convergent – divergent nozzle and turbine rotor find good agreement with the experimental results of Naval Science and Technological Laboratory, Visakhapatnam.

REFERENCES

[1] Bong-Gunshin, Young-Jae Kwak, Kui-soon Kim and Jin-Han Kim, "A study on nozzle – Rotor Interaction losses for geometric conditions of a partial admission impulse turbine". Proceedings of Asian joint conference on propulsion and power 2006, Beijing, China, April 20-23, 2006.

[2] A.A.Khan and T.R.Shem bharkar, "Viscous flow analysis in a convergent – Divergent nozzle". Proceedings of the international conference on Aero space science and Technology, Banglore, India, June 26-28, 2008.

[3] Nicholas J. Georgia dis, Teryn W.Dal Bellow, chorles J.Tretry, and Albert L.Johns, "Aerodynamic Design and analysis of High performance nozzles for Mach 4 Accebrator Vehicles", 44th AIAA Aero Space Sciences meeting and exhibit, 9-12 January 2006, Nerada.

[4] K.Sukati and Y.Shinizu, "Effect of the increase in the entrance convergent section length of the gun nozzle on the high velocity oxygen fuel and cold spray process", 24th October 2000, ASM international.

[5] Leonid Moroz, Yuri Gororuschenko, Petr Pagur, "Axial turbine stanges design: ID/2D/3D simulation, Experimal, Optimization", Proceedings of GT 2005 ASME Turbo Expo 2005: Nerada USA.

[6] B.Jodoin, "Cold Spray nozzle Mach number limitation', February 14 2001, ASM international. A. Husain, D. K. Sehgal, and R. K. Pandey, "An inverse finite element procedure for the

Observations on the Ternary Cubic Equation $x^2 - xy + y^2 = 7z^3$

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ABSTRACT:

The non-homogeneous cubic equation with three unknowns represented by the diophantine equation $X^2 - XY + Y^2 = 7Z^3$ *is analyzed for its patterns of non-zero distinct integral solutions. A few interesting relations between the solutions and special numbers are exhibited.*

Keywords: *Integral solutions, non-homogeneous cubic equation with three unknowns.*

M.Sc 2000 mathematics subject classification: 11D25

Notations:

$t_{m,n}$: Polygonal number of rank n with size m

P_n^m : Pyramidal number of rank n with size m

S_n : Star number of rank n

$\Pr_n$: Pronic number of rank n

j_n : Jacobsthal lucas number of rank n

J_n : Jacobsthal number of rank n

CP_n^m : Centered Pyramidal number of rank n with size m.

I. INTRODUCTION

The Diophantine equations offer an unlimited field for research due to their variety [1-3]. In particular, one may refer [4-17] for cubic equations with three unknowns. This communication concerns with yet another interesting equation $X^2 - XY + Y^2 = 7Z^3$ representing non-homogeneous cubic with three unknowns for determining its infinitely many non-zero integral points. Also, a few interesting relations among the solutions are presented.

II. METHOD OF ANALYSIS

The ternary non-homogeneous cubic Diophantine equation to be solved for its distinct non-zero integral solution is $x^2 - xy + y^2 = 7z^3$ (1)

2.1Pattern:1

Introduction of the transformations

$$x = u + v, \qquad y = u - v \tag{2}$$

In (1) leads to

$$u^2 + 3v^2 = 7z^3 \tag{3}$$

Let $z = a^2 + 3b^2$ (4)

Write 7 as

$$7=\frac{(5*2^n+i2^n\sqrt{3})(5*2^n-i2^n\sqrt{3})}{2^{2n+2}} \quad (5)$$

Using (4) and (5) in (3) and applying the method of factorization, define

$$u+i\sqrt{3}v=\frac{(5*2^n+i2^n\sqrt{3})}{2^{n+1}}(a+i\sqrt{3}b)^3$$

Equating real and imaginary parts, we get

$$u=\frac{2^n}{2^{n+1}}[5(a^3-9ab^2)-9(a^2b-b^3)] \quad (6)$$

$$v=\frac{2^n}{2^{n+1}}[(a^3-9ab^2)+15(a^2b-b^3)] \quad (7)$$

Using (6) and (7) in (2), we have

$$\left.\begin{aligned} x(a,b)&=\frac{2^n}{2^{n+1}}[6(a^3-9ab^2)+6(a^2b-b^3)]\\ y(a,b)&=\frac{2^n}{2^{n+1}}[4(a^3-9ab^2)-24(a^2b-b^3)]\\ z(a,b)&=(a^2+3b^2)\end{aligned}\right\} \quad (8)$$

Where n= 0,1, 2……..

Properties:

(1) $x(2^n,1)=3[j_{3n}-9j_n+3J_{2n}-(-1)^{3n}+9(-1)^n+(-1)^{2n}-1]$

(2) $y(2^n,1)=3J_{3n+1}-9j_{n+1}-3j_{2n+2}+(-1)^{3n+1}+9(-1)^{n+1}+15$

(3) $z(1,2^n)=3j_{2n}-2$

For illustration and clear understanding, substituting n=1 in (8), the corresponding non-zero distinct integral solutions to (1) are given by

$$x(a,b)=3(a^3-9ab^2)+3(a^2b-b^3)]$$
$$y(a,b)=2(a^3-9ab^2)-12(a^2b-b^3)]$$
$$z(a,b)=(a^2+3b^2)$$

Properties:

(1) $x(1,n)=3-29t_{4,n}+4t_{3,n}-2CP_n^9$

(2) $y(1,n)=3CP_n^4-62t_{3,n}+31t_{4,n}-S_n+14$

(3) $x(1,n)+y(1,n)+z(1,n)=CP_n^{12}-16t_{3,n}-37t_{4,n}+6$

(4) $x(1,n)+y(1,n)-6P_n^7+6t_{6,n}\equiv 9(\mathrm{mod}49)$

(5) $y(n,1)-2P_n^8+t_{28,n}\equiv 12(\mathrm{mod}29)$

2.2Pattern:2

Introducing the linear transformations

$$u=\alpha+3T, \qquad v=\alpha-T \quad (9)$$

Substituting in (3) we get

$$4\alpha^2+12T^2=7z^3 \quad (10)$$

Let $z=a^2+12b^2$ (11)

Write 7 as

$$7=\frac{(4+i\sqrt{12})(4-i\sqrt{12})}{4} \quad (12)$$

Using (11) and (12) in (10), we get

$$2\alpha + i\sqrt{12}T = \frac{4 + i\sqrt{12}}{2}(a + i\sqrt{12}b)^3$$

Equating real and imaginary parts, we obtained

$$2\alpha = 2(a^3 - 36ab^2) - 6(3a^2b - 12b^3)$$

$$2T = (a^3 - 36ab^2) + 4(3a^2b - 12b^3)$$

Hence the values of x and y satisfies (1) are given by

$$x(a,b) = 3(a^3 - 36ab^2) - 2(3a^2b - 12b^3)$$

$$y(a,b) = 2(a^3 - 36ab^2) + 8(3a^2b - 12b^3)$$

$$z(a,b) = (a^2 + 12b^2)$$

Properties:

(1) $x(1,n) = 3[6CP_n^{25} - 6CP_n^{24} - 70t_{3,n} + 33t_{4,n} + 8]$

(2) $z(1,n) = t_{24,n} + 20t_{3,n} - 9t_{4,n} + 1$

(3) $y(n,1) = 3CP_n^4 + 2t_{23,n} + 2t_{5,n} - 106t_{3,n} + 53t_{4,n} - 96$

(4) $x(n,1) + y(n,1) - 10P_n^5 - t_{28,n} \equiv -72 (\mathrm{mod}168)$

(5) $y(n,n) - z(n,n) + 284P_n^5 - 43t_{8,n} \equiv 0 (\mathrm{mod}86)$

2.3Pattern:3

Instead of (12) we write 7 as

$$7 = \frac{(10 + i\sqrt{12})(10 - i\sqrt{12})}{16}$$

Following the procedure as presented in pattern 2 the corresponding non-zero distinct integral solutions to (1) are obtained as

$$x(a,b) = 3(a^3 - 36ab^2) + 2(3a^2b - 12b^3)$$

$$y(a,b) = 3(a^3 - 36ab^2) + 10(3a^2b - 12b^3)$$

$$z(a,b) = (a^2 + 12b^2)$$

Properties:

(1) $y(n,1) = 2CP_n^3 + t_{24,n} + 12t_{21,n} - 20t_{3,n} + 10t_{4,n} - 120$

(2) $x(1,n) = 3[-3CP_n^{16} - CP_{6,n} - 33t_{4,n} + 2]$

(3) $x(n,1) - 6P_n^5 - t_{8,n} \equiv -24 (\mathrm{mod}106)$

(4) $x(n,1) - z(n,1) - 6P_n^5 - t_{6,n} \equiv -36 (\mathrm{mod}107)$

(5) $z(1,n) - x(1,n) - 48P_n^5 - 48t_{6,n} \equiv -2 (\mathrm{mod}42)$

2.4Pattern:4

Introducing the linear transformations

$$u = \alpha - 3T, \qquad v = \alpha + T \tag{13}$$

Let $z = a^2 + 3b^2$ (14)

Write 7 as

$$7 = (2 + i\sqrt{3})(2 - i\sqrt{3}) \tag{15}$$

Substituting (13), (14) and (15) in (3) and repeating the process as in pattern2, the non-zero distinct integral solutions to (1) are obtained as

$$x(a,b) = (a^3 - 9ab^2) - 15(a^2b - b^3)$$

$$y(a,b) = -2(a^3 - 9ab^2) - 12(a^2b - b^3)$$

$$z(a,b) = a^2 + 3b^2$$

Properties:

(1) $x(n,1) - y(n,1) = 3[2CP_n^3 - CP_{4,n} + t_{20,n} - 8t_{4,n} + 2]$

(2) $x(2^n,1)-y(2^n,1)=3[j_{3n}-27J_n-j_{2n}-(-1)^{3n}-9(-1)^n+2]$

(3) Each of the following represents a nasty number:

(a) $y(3a^2,1)-x(3a^2,1)-t_{14,3a^2}+6P_{3a^2}^5+3$

(b) $7\{42-2x(a,1)-y(a,1)\}$

(c) $6\{x(a,a)-z(a,a)+16P_a^5\}$

(d) $2\{32P_a^5-y(a,a)-z(a,a)\}$

2.5Pattern:5

Instead of (15) we write 7 as

$$7=\frac{(8+i2\sqrt{12})(8-i2\sqrt{12})}{16}$$

Following the procedure as presented in pattern4, the corresponding non-zero distinct integral solutions to (1) are

$$x(a,b)=(a^3-36ab^2)-10(3a^2b-12b^3)$$
$$y(a,b)=-2(a^3-36ab^2)-8(3a^2b-12b^3)$$
$$z(a,b)=a^2+12b^2$$

Properties:

(1) $x(1,n)-y(1,n)=6CP_n^{24}-t_{24,n}-2t_{6,n}-93t_{4,n}+3$

(2) $x(n,1)=2CP_n^3-2CP_{29,n}-16t_{3,n}+7t_{4,n}=122$

(3) $y(n,1)=-2[2CP_n^3-74t_{3,n}+37t_{4,n}]-8[t_{8,n}+4t_{3,n}-2t_{4,n}-12]$

(4) Each of the following represents a nasty number:

(a) $7\{110P_n^5-x(n,n)-z(n,n)\}$

(b) $6\{x(n,n)-y(n,n)+z(n,n)+174P_n^5\}$

2.6Pattern:6

(1) can be written as

$$(2x-y)^2+3y^2=28z^3 \qquad (16)$$

One may write 28 as

$$28=(5+i\sqrt{3})(5-i\sqrt{3}) \qquad (17)$$

Substituting (17) and (4) in (16), employing the method of factorization, we have

$$(2x-y)+i\sqrt{3}y=(5+i\sqrt{3})(a+i\sqrt{3}b)^3$$

Equating real and imaginary parts, we have

$$\left.\begin{aligned}x(a,b)&=3(a^3-9ab^2)+3(a^2b-b^3)\\ y(a,b)&=(a^3-9ab^2)+15(a^2b-b^3)\end{aligned}\right\} \qquad (18)$$

Thus (14) and (18) represents the non-zero distinct integral solutions to (1)

Properties:

(1) $x(n,1)=2CP_n^9+t_{8,n}-48t_{3,n}+24t_{4,n}-3$

(2) $y(1,n)=-6CP_n^{13}-2CP_n^9+2CP_n^3-t_{20,n}-6t_{3,n}+2t_{4,n}+1$

(3) $y(1,n)+18P_n^7\equiv 1(\mathrm{mod}9)$

(4) $x(n,1)-6P_n^5+3\equiv 0(\mathrm{mod}27)$

(5) $6P_n^3-y(n,1)-3t_{10,n}\equiv -15(\mathrm{mod}2)$

III. REMARKS

(1) Let (x_0, y_0, z_0) be the initial solution of (1)

Let
$$\left.\begin{aligned} x &= 7^3 x_0 + h \\ y_1 &= 7^3 y_0 + h \\ z_1 &= 7^2 z_o \end{aligned}\right\} \quad (19)$$

be the first solution of (1).
Substituting (18) in (1), we get

$$h = -7^3(x_0 + y_0) \quad (20)$$

Using (20) in (19) we obtain the general solution as follows:

EVEN ORDERED SOLUTION:

$$x_{2n} = 7^{6n} x_0,$$
$$y_{2n} = 7^{6n} y_0,$$
$$z_{2n} = 7^{4n} z_0,$$

where n=1, 2, 3, …..

ODD ORDERED SOLUTION:

$$x_{2n-1} = -7^{3(2n-1)} y_0,$$
$$y_{2n-1} = -7^{3(2n-1)} x_0,$$
$$z_{2n-1} = -7^{2(2n-1)} z_0,$$

where n=1, 2, 3, …..

Properties:

1. $48\left[\left(\frac{z_0}{x_0}\right)\sum_{n=0}^{N-1}\left(\frac{x_{2n}}{z_{2n}}\right)\right] + 1 \equiv 0 (\text{mod } 7)$
2. $x_0^2 z_{2n}^3 = x_{2n}^2 z_0^3$
3. Each of the following is a nasty number:

(i). $6\left[\frac{x_{2n} y_{2n} z_{2n}}{x_0 y_0 z_0}\right]$, (ii). $6\left(\frac{z_{2n}}{z_{2n-1}}\right)$, (iii). $6\left(\frac{z_0 y_{2n}}{y_0 z_{2n}}\right)$, (iv). $6\left(\frac{z_0 x_{2n}}{x_0 z_{2n}}\right)$, (v). $6\left(\frac{z_{2n}}{z_{2n-1}}\right)$

4. Each of the following is a cubic integer:

(i). $\left(\frac{x_{2n}}{x_0}\right)\left(\frac{-y_0}{x_{2n-1}}\right)$, (ii). $\left(\frac{-x_{2n}}{y_{2n-1}}\right)$, (iii). $\left(\frac{-y_{2n}}{x_{2n-1}}\right)$, (iv). $\left(\frac{y_{2n}}{y_0}\right)\left(\frac{-x_0}{y_{2n-1}}\right)$

II. Employing the solutions(x, y, z) of (1), the following relations among the special polygonal and pyramidal numbers are obtained.

1. $\left[\frac{3P^3_{x-2}}{t_{3,x-2}}\right]^2 - \left[\frac{3P^3_{x-2}}{t_{3,x-2}}\right]\left[\frac{P^5_y}{t_{3,y}}\right] + \left[\frac{P^5_y}{t_{3,y}}\right]^2 = 7\left[\frac{6P^4_{z-1}}{t_{3,2(z-1)}}\right]^3$
2. $\left[\frac{6P^4_{x-1}}{t_{3,2(x-1)}}\right]^2 - \left[\frac{6P^4_{x-1}}{t_{3,2(x-1)}}\right]\left[\frac{3P^3_{y-2}}{t_{3,y-2}}\right] + \left[\frac{3P^3_{y-2}}{t_{3,y-2}}\right]^2 = 7\left[\frac{P^5_z}{t_{3,z}}\right]^3$
3. $\left[\frac{2P^8_{x-1}}{t_{3,2x-3}}\right]^2 - \left[\frac{2P^8_{x-1}}{t_{3,2x-3}}\right]\left[\frac{6P^4_y}{t_{3,2y+1}}\right] + \left[\frac{6P^4_y}{t_{3,2y+1}}\right]^2 = 7\left[\frac{3P^3_z}{t_{3,z+1}}\right]^3$
4. $\left[\frac{6P^4_x}{t_{3,2x+1}}\right]^2 - \left[\frac{6P^4_x}{t_{3,2x+1}}\right]\left[\frac{6P^4_{y-1}}{t_{3,2(y-1)}}\right] + \left[\frac{6P^4_{y-1}}{t_{3,2(y-1)}}\right]^2 = 7\left[\frac{3P^3_{z-2}}{t_{3,z-2}}\right]^3$

IV. CONCLUSION

To conclude, one may search for other pattern of solutions and their corresponding properties.

REFERENCES

[1]. Dickson. I. E. ‘’History of the Theory of Numbers’’, Vol 2. Diophantine analysis, New York, Dover, 2005.

[2]. Mordell .L J., “Diophantine Equations’’ Academic Press, New York,1969.

[3]. Carmichael. R.D. “The Theory of numbers and Diophantine Analysis’’, New York, Dover, 1959.

[4]. Gopalan.M.A.,Anbuselvi.R. Integral solutions of Ternary Cubic Diophantine Equations $x^2 + y^2 + 4N = zxy$,Pure and Applied Mathematica Sciences, Vol.LXVII(NO.1-2):107-111,March(2008).

[5]. Gopalan.M.A., Manjusomnath and Vanith N., “On Ternary Cubic Diophantine Equations $x^2 + y^2 = 2z^3$ ’’, Advances in Theoretical and Applied Mathematics,Vol.1(No.3)Pg.227-231(2006).

[6]. Gopalan.M.A., Manjusomnath and Vanith N., “On Ternary Cubic Diophantine Equations $x^2 + y^2 = 2z^3$ ’’, Acta Ciencia Indica, Vol.XXXIIIM(No.3) Pg.705-707(2007).

[7]. Gopalan.M.A.,and Pandiselvi .V., “Integral solutions of Ternary Cubic Diophantine Equations $x^2 - xy + y^2 = (k^2 - 2kz + 4)z^3$ ’’,Pacific Asian journal of Mathematics, Vol.2.No.1-2,Pg.91-91,2008.

[8]. Gopalan.M.A., and KaligaRani.J., “Integral solutions of $x^2 - ay^2 = (a-1)z^3$ $(a > 1$ and a is square free) ’’, Impact J.Sci.Tec,Vol.2(4)Pg.201-204.2008

[9]. Gopalan.M.A.,Devibala.S., and Manjusomnath., “Integral solutions of $x^3 + x + y^3 + y = 4(z-2)(z+2)$ ’’, Impact.J.Sci.Tech.Vol.2(2)Pg.65-69,2008

[10]. Gopalan.M.A., Manjusomnath and Vanith N., “Ternary Cubic diophantine Equation $2^{2a-1}(x^2 + y^2) = z^3$ ’’,Acta Ciencia Indica,Vol.XXXIVM(No.3)Pg.135-137(2008).

[11]. Gopalan.M.A., and KaligaRani.J., “Integral solutions of $x^3 + y^3 + 8k(x+y) = (2k+1)z^3$ ’’,Bulletin of pure and Applied Sciences,Vol.29E(No.1)Pg.95-99(2010).

[12]. Gopalan.M.A., and Janaki.G., “Integral solutions of $x^2 - y^2 + xy = (m^2 - 5n^2)z^3$ ’’,Antartica J.Math.,7(1)Pg.63-67(2010).

[13]. Gopalan.M.A., and Shanmugananthan.P., “ On the Equation $x^2 + xy - y^2 = (n^2 + 4n - 1)z^3$ ’’, Bulletin of pure and Applied Sciences, Vol.29E, Pg.231-235 Issue 2(2010).

[14]. Gopalan.M.A., and Vijayasankar.A., “ Integral Solutions of Ternary Cubic Equation $x^2 + y^2 - xy + 2(x+y+2) = z^3$ ’’,Antartica J.Math.,Vol.7(N0.4). Pg.455-460(2010).

[15]. Gopalan.M.A., and KaligaRani.J., “ Integral solutions of Ternary Cubic Equation $x^3 + y^3 + 4z^3 = 3xy(x+y)$ ’’, Antartica J.Math.,7(3)Pg.311-315(2010).

[16]. Gopalan.M.A.,and Pandiselvi .V., “On the Ternary Cubic Diophantine Equation $y^2 + gz^2 = (k^2 + g)z^3$ ’’,Impact.J.Sci.Tech.,Vol.4,No.4,Pg117-23.(2010).

[17]. Gopalan.M.A,Vidhyalakshmi.S.,Sumathi.G., “On the homogeneous cubic equation with threer unknowns $x^3 + y^3 = 14z^3 + 3(x+y)$ ’’,Discovery Science, Vol.2, No.4. Pg.37-39.,Oct 2012

Integral Solutions of the Homogeneous Cubic Equation

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ABSTRACT:

The cubic equation $x^3+y^3+xy(x+y)-z^3-w^3-zw(z+w)=(x+y+z+w)X^2$ *is analysed for its non-zero integral solutions. A few interesting relations between the solutions and special numbers are exhibited.*

Keywords: *Homogeneous equation with five unknowns, Integral solutions.*

M.Sc 2000 Mathematics subject classification:11D25

NOTATIONS:

Special Number	Notations	Definitions
Gnomonic number	G_n	$2n-1$
Pronic number	P_n	$n(n+1)$
Star number	S_n	$6n(n-1)+1$
Octahedral number	OH_n	$\frac{n(2n^2+1)}{3}$

I. I.INTRODUCTION

Integral solutions for the homogeneous or non-homogeneous Diophantine cubic equations is an interesting concept as it can be seen from[1-2]. In [3-13] a few special cases of cubic Diophantine equations with 4 unknowns are studied. In [14-15], the cubic equation with five unknowns is studied for its non-zero integral solutions. This communication concerns with a another interesting cubic equation with five unknowns given by $x^3+y^3+xy(x+y)-z^3-w^3-zw(z+w)=(x+y+z+w)X^2$ for determining its integral solutions. A few interesting relations between the solutions are presented.

II. METHOD OF ANALYSIS

The cubic Diophantine equation with five unknowns to be solved for getting non-zero integral solutions is

$$x^3+y^3+xy(x+y)-z^3-w^3-zw(z+w)=(x+y+z+w)X^2 \quad (1)$$

On substituting the linear transformations

$$x=u+v,\ y=u-v,\ z=u+p,\ w=u-p \quad (2)$$

in (1) leads to

$$v^2-p^2=X^2 \quad (3)$$

2.1Pattern 1:

Equation (3) can be written as,

$$v^2=p^2+X^2 \quad (4)$$

which is satisfied by

$$\left.\begin{aligned} v &= m^2+n^2,\ p = 2mn,\ X = m^2-n^2 \\ v &= m^2+n^2,\ p = m^2-n^2,\ X = 2mn \end{aligned}\right\} m>n>o \qquad (5)$$

Substituting (5) in (2) , the two sets of solutions satisfying (1) are obtained as follows:

SET 1:

$$x(u,m,n) = u+m^2+n^2$$
$$y(u,m,n) = u-m^2-n^2$$
$$z(u,m,n) = u+2mn$$
$$w(u,m,n) = u-2mn$$
$$X(m,n) = m^2-n^2$$

SET 2:

$$x(u,m,n) = u+m^2+n^2$$
$$y(u,m,n) = u-m^2-n^2$$
$$z(u,m,n) = u+m^2-n^2$$
$$w(u,m,n) = u-m^2+n^2$$
$$X(m,n) = 2mn$$

2.2Pattern 2:

Equation (3) can be written as

$$p^2+X^2 = v^2*1 \qquad (6)$$

Assume $v = a^2+b^2$ (7)

Write 1 as

$$1 = \frac{(1+i)^{2n}(1-i)^{2n}}{2^{2n}} \qquad (8)$$

Substituting (7) and (8) in (6) and using the method of factorization, define

$$p+iX = (a+ib)^2\frac{(1+i)^{2n}}{2^n} \qquad (9)$$

Equating real and imaginary parts of (9),we have

$$p = (a^2-b^2)\cos\frac{n\pi}{2} - 2ab\sin\frac{n\pi}{2}$$

$$X = (a^2-b^2)\sin\frac{n\pi}{2} + 2ab\cos\frac{n\pi}{2}$$

The corresponding integral values of x, y, z, w and X satisfying (1) are obtained as,

$$x(u,a.b) = u + a^2 + b^2$$
$$y(u,a,b) = u - a^2 - b^2$$
$$z(u,a,b) = u + (a^2 - b^2)\cos\frac{n\pi}{2} - 2ab\sin\frac{n\pi}{2}$$
$$w(u,a,b) = u - (a^2 - b^2)\cos\frac{n\pi}{2} + 2ab\sin\frac{n\pi}{2}$$
$$X(a,b) = (a^2 - b^2)\sin\frac{n\pi}{2} + 2ab\cos\frac{n\pi}{2}$$

Properties:

1.Each of the following expression is a nasty number

i. $3\left[x(u,a,b) - y(u,a,b)\right]^2 + (-1)^n\left[12x(u,a,b)^2 - 3(z(u,a,b) - w(u,a,b))^2\right]$

ii. $6\left[x(u,a,b) \times y(u,a,b) + (a^2 + b^2)^2\right]$

2. $(2x(u,a,b), z(u,a,b) - w(u,a,b), x(u,a,b) - y(u,a,b))$ forms a Pythagorean triple.

3.If a, b are taken as the generators of the Pythagorean triangle (α, β, γ) whose sides are $\alpha = a^2 - b^2; \beta = 2ab; \gamma = a^2 + b^2$ then the product $\left[X(a,b)\sin\frac{n\pi}{2} + \left(\frac{z(u,a,b) - w(u,a,b)}{2}\right)\cos\frac{n\pi}{2}\right]\left[X(a,b)\cos\frac{n\pi}{2} - \left(\frac{z(u,a,b) - w(u,a,b)}{2}\right)\sin\frac{n\pi}{2}\right]$ represents two times its area.

4. $x(u,a,b)y(u,a,b) - z(u,a,b)w(u,a,b) \equiv 0(\text{mod}2)$

5. $x(u,a,b) \pm y(u,a,b) \equiv 0(\text{mod}2)$

2.3Pattern 3:

In (6) 1 can be written as

$$1 = \frac{(p^2 + q^2 + i2pq)(p^2 - q^2 - i2pq)}{(p^2 + q^2)^2} \; ; \qquad p > q > 0$$

Proceeding as in Pattern II

$$p + iX = (a + ib)^2 \frac{(p^2 + q^2 + i2pq)(p^2 - q^2 - i2pq)}{(p^2 + q^2)^2} \qquad (10)$$

Equating real and imaginary parts,

$$p = (a^2 - b^2)\frac{(p^2 - q^2)}{(p^2 + q^2)} - 4ab\frac{pq}{(p^2 + q^2)} \qquad (11)$$

$$X = (a^2 - b^2)\frac{2pq}{(p^2 + q^2)} + 2ab\frac{(p^2 - q^2)}{(p^2 + q^2)} \qquad (12)$$

Since our aim is to find the integral solutions, substituting $a=(p^2+q^2)A, b=(p^2+q^2)B$ in (7),(11) and (12)

$$v=(p^2+q^2)^2(A^2+B^2) \tag{13}$$

$$p=(p^2+q^2)\left[(A^2-B^2)(p^2-q^2)-4ABpq\right] \tag{14}$$

$$X=2pq(p^2+q^2)(A^2-B^2)+2(p^2+q^2)AB(p^2-q^2) \tag{15}$$

Substituting (13), and (14) in (2) and using (15) we have the integral solutions of (1) as,

$$x(u,A,B)=u+(p^2+q^2)^2(A^2+B^2)$$
$$y(u,A,B)=u-(p^2+q^2)^2(A^2+B^2)$$
$$z(u,A,B)=u+(p^2+q^2)(A^2-B^2)(p^2-q^2)-(p^2+q^2)4ABpq$$
$$w(u,A,B)=u-(p^2+q^2)(A^2-B^2)(p^2-q^2)+(p^2+q^2)4ABpq$$
$$X(A,B)=2pq(p^2+q^2)(A^2-B^2)+2(p^2+q^2)AB(p^2-q^2)$$

Properties:

1. $4pq\left[z(u,p,q)-w(u,p,q)\right]-2(p^2+q^2)x(u,p,q)\equiv 0(\text{mod } 8)$

2. $2G_p(p^4-q^4)+w(u,p,p-1)-z(u,p,p-1)\equiv 0(\text{mod}8)$

3. $pq\left[z(u,p,p-1)-w(u,p,p-1)\right]-(p^2-q^2)x(u,p,p-1)+2(p^2+q^2)^3P_{p-1}=0$

4. $2(p^2+q^2)^2S_p+3\left[y(u,p,p-1)-x(u,p,p-1)\right]\equiv 0(\text{mod}4)$

5. $3OH_{pq}+z(u,p,p)-w(u,p,p)-pq\equiv 0(\text{mod } 2)$

6. $w(u,p,q)-z(u,p,q)+x(u,p,q)+10(p^2+q^2)q^2$ is a perfect square.

7. Each of the following expression is a nasty number

i. $6u\left[x(u,A,B)+y(u,A,B)+z(u,A,B)+w(u,A,B)\right]$

ii. $6\left[x(u,A,A)-y(u,A,A)\right]$

III. CONCLUSION

To conclude one may search for other patterns of solutions and their corresponding properties.

REFERENCES

[1]. L.E. Dickson, History of Theory of Numbers, Vol 2,Chelsea Publishing Company, New York, 1952.

[2]. L.J .Mordell, Diophantine Equations, Academic Press,London,1969.

[3]. M.A. Gopalan, and S. Premalatha, Integral solutions of $(x+y)(xy+w^2)=2(k^2+1)z^3$, Bulletin of Pure and Applied Sciences, Vol.29E,No.2,197-202, 2009.

[4]. M.A. Gopalan, and V. Pandichelvi, Remarkable Solutions on the cubic equation with four unknowns $x^3+y^3+z^3=28(x+y+z)w^2$, Antarctica J Math, ,Vol.7, No.4,393-401, 2010.

[5]. M.A. Gopalan, and B.Sivakami, Integral solutions of homogeneous cubic equation with four unknowns $x^3+y^3+z^3=3xyz+2(x+y)w^3$, Impact. J.Sci.Tech.Vol.4,No.3,53-60,2010.

[6]. M.A.Gopalan and S.Premalatha, On the cubic Diophantine equation with four unknowns $(x-y)(xy+w^2)=2(n^2+2n)z^3$, International Journal of Mathematical Sciences, Vol.9,No.1-2, Jan-June, 171-175,2010.

[7]. M.A.Gopalan and J.Kaligarani, Integral solutions of $x^3+y^3+xy(x+y)=z^3+w^3+(z+w)zw$ Bulletin of Pure and Applied Sciences, Vol.29E,No.1,169-173, 2010.

[8]. M.A. Gopalan,and S. Premalatha, Integral solutions of $(x+y)(xy+w^2)=2(k+1)z^3$, The Global Journal of Applied Mathematics and Mathematical Sciences, Vol.3,No.1-2, 51-55,2010.

[9]. M.A.Gopalan , S.Vidhyalakshmi, and A.Mallika, Observation on cubic equation with four unknowns $xy+2z^2=w^3$, The Global Journal of Applied Mathematics and Mathematical Sciences, Vol.2,No.1-2, 69-74,2012.

[10]. M.A.Gopalan , S.Vidhyalakshmi, and A.Mallika, Observation on cubic equation with four unknowns $2(x^3+y^3)=z^3+w^2(x+y)$,IJAMP,Vol.4,No.2, 103-107,2012.

[11]. M.A.Gopalan , S.Vidhyalakshmi, and G.Sumathi, On the homogeneous cubic equation with four unknowns $x^3+y^3=14z^3-3w^2(x+y)$, Discovery, Vol.2, Np.4,17-19,2012.

[12]. M.A.Gopalan and K.Geetha , Observations on cubic equation with four unknowns $x^3+y^3+xy(x+y)=z^3+2(x+y)w^2$, International Journal of Pure and Applied Mathematical Sciences, Vol.6,No.1,25-30,2013.

[13]. M.A.Gopalan , Manju Somanath and V.Sangeetha Lattice Points on the homogeneous cubic equation with four unknowns $(x+y)(xy+w^2)=(k^2-1)z^3, k>1.$ Indian journal of Science, Vol.2,No.4, 97-99,2013.

[14]. M.A. Gopalan, S.Vidhyalakshmi,and T.R.UshaRani, On the cubic equation with five unknowns $x^3+y^3=z^3+t^2(x+y)+w^3$, Indian journal of Science, Vol.1,No.1,17-20,2012.

[15]. M.A. Gopalan, S.Vidhyalakshmi,and T.R.UshaRani, Integral solutions of the cubic equation $x^3+y^3+u^3+v^3=kt^3$, Bessel J.Math, Vol.3,No.1,69-75,2013.

Observations on Icosagonal number

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ABSTRACT
We obtain different relations among Icosagonal number and other two, three and four dimensional figurate numbers.

Keyword: *Polygonal number, Pyramidal number, centered polygonal number, Centered pyramidal number, Special number*

I. INTRODUCTION

The numbers that can be represented by a regular arrangement of points are called the polygonal numbers (also known as two dimensional figurate numbers). The polygonal number series can be summed to form solid three dimensional figurate numbers called Pyramidal numbers that be illustrated by pyramids [1].Numbers have varieties of patterns [2-16] and varieties of range and richness. In this communication we deal with Icosagonal numbers given by $t_{20,n} = 9n^2 - 8n$ and various interesting relations among these numbers are exhibited by means of theorems involving the relations.

Notation

$t_{m,n}$ = Polygonal number of rank n with sides m

p_n^m = Pyramidal number of rank n with sides m

$F_{m,n,p}$ = m-dimensional figurate number of rank n where generated polygon is of p sides

jal_n = Jacobsthal Lucas number

$ct_{m,n}$ = Centered Polygonal number of rank n with sides m

cp_n^m = Centered Pyramidal number of rank n with sides m

g_n = Gnomonic number of rank n with sides m

p_n = Pronic number

$carl_n$ = Carol number

mer_n = Mersenne number, where n is prime

cul_n = Cullen number

Tha_n = Thabit ibn kurrah number

wo_n = Woodall number

II. INTERESTING RELATIONS

1. $\sum_{n=1}^{N} t_{20,n} = 9p_N^4 - 8t_{3,N}$

Proof

$$\sum_{n=1}^{N} t_{20,n} = \sum_{n=1}^{N} [9n^2 - 8n]$$

$$= 9\sum_{n=1}^{N} n^2 - 8\sum_{n=1}^{N} n$$

$$= 9\frac{N(N+1)(2N+1)}{2} - 8\frac{N(N+1)}{2}$$

$$\sum_{n=1}^{N} t_{20,n} = 9p_N^4 - 8t_{3,N}$$

2. $\left(t_{20,n} * t_{12,n}\right) - 4\left(t_{7,n} * t_{11,n}\right) + 25cp_n^6 = 22p_n^5$

Proof

$$\left(t_{20,n} * t_{12,n}\right) - 4\left(t_{7,n} * t_{11,n}\right) = -14n^3 + 11n^2$$

$$= -25n^3 + 11\left(n^3 + n^2\right)$$

$$\left(t_{20,n} * t_{12,n}\right) - 4\left(t_{7,n} * t_{11,n}\right) + 25cp_n^6 = 22p_n^5$$

3. $t_{20,n+1} - 2t_{11,n} - g_n - 15n = 2$

Proof

$$t_{20,n+1} = 9n^2 - 10n + 1$$

$$= 9n^2 - 7n + 2n - 1 + 15n + 2$$

$$= 2t_{11,n} + g_n + 15n + 2$$

$$t_{20,n+1} - 2t_{11,n} - g_n - 15n = 2$$

4. $t_{20,n+1} + t_{20,n-1} - n = t_{38,n} + 18$

Proof

$$t_{20,n+1} + t_{20,n-1} = 18n^2 - 16n + 18$$

$$= 18n^2 - 17n + n + 18$$

$$t_{20,n+1} + t_{20,n-1} - n = t_{38,n} + 18$$

5. The following triples are in arithmetic progression

a) $\left(t_{19,n}, t_{20,n}, t_{21,n}\right)$

Proof

$$t_{19,n} + t_{21,n} = \frac{1}{2}\left(17n^2 - 15n + 19n^2 - 17n\right)$$

$$= 2\left(9n^2 - 8n\right)$$

$$t_{19,n} + t_{21,n} = 2t_{20,n}$$

b) $\left(t_{20,n}, t_{21,n}, t_{22,n}\right)$

Proof

$$t_{20,n} + t_{22,n} = 9n^2 - 8n + 10n^2 - 9n$$

$$t_{20,n} + t_{22,n} = 2t_{21,n}$$

c) $\left(t_{10,n}, t_{20,n}, t_{30,n}\right)$

Proof

$$t_{10,n} + t_{30,n} = 4n^2 - 3n + 14n^2 - 13n$$

$$t_{10,n} + t_{30,n} = 2t_{20,n}$$

d) $\left(t_{18,n}, t_{20,n}, t_{22,n}\right)$

Proof

$$t_{18,n} + t_{22,n} = 8n^2 - 7n + 10n^2 - 9n$$

$$t_{18,n} + t_{22,n} = 2t_{20,n}$$

e) $\left(t_{16,n}, t_{20,n}, t_{24,n}\right)$

Proof

$$t_{16,n} + t_{24,n} = 7n^2 - 6n + 11n^2 - 10n$$

$$t_{16,n} + t_{24,n} = 2t_{20,n}$$

6. $nt_{20,n+1} = 6p_n^{10} + 2p_n^5 + 12t_{3,n}$

Proof

$$nt_{20,n+1} = 9n^3 + 10n^2 + n$$

$$= 8n^3 + 3n^2 - 5n + n^3 + n^2 + 6n^2 + 6n$$

$$nt_{20,n+1} = 6p_n^{10} + 2p_n^5 + 12t_{3,n}$$

7. $t_{20,2^n} + 17 = 9ky_n - 26mer_n$

Proof

$$t_{20,2^n} = 9\left(2^{2n}\right) - 8\left(2^n\right)$$

$$= 9\left(2^{2n} + 2\left(2^n\right) - 1\right) - 26\left(2^n - 1\right) - 17$$

$$t_{20,2^n} + 17 = 9ky_n - 26mer_n$$

8. $t_{20,2^n} - t_{16,2^n} = mer_{2n} + carl_n + 2$

Proof

$$t_{20,2^n} - t_{16,2^n} = 2\left(2^{2n}\right) - 2\left(2^n\right)$$

$$= \left(2^{2n} - 1\right) + \left(2^{2n} - 2^{n+1} - 1\right) + 2$$

$$t_{20,2^n} - t_{16,2^n} = mer_{2n} + carl_n + 2$$

9. $n\left(3t_{8,2^n} - t_{20,2^n}\right) = cul_n + wo_n$

Proof

$$n\left(3t_{8,2^n} - t_{20,2^n}\right) = n\left(2^n\right) + 1 + n\left(2^n\right) - 1$$

$$n\left(3t_{8,2^n} - t_{20,2^n}\right) = cul_n + wo_n$$

10. $3t_{8,2^n} - t_{20,2^n} = Tha_{2n} + 1$

Proof

$$3t_{8,2^n} - t_{20,2^n} = 3\left(2^{2n}\right)$$

$$= Tha_{2n} + 1$$

11. $4\left(2t_{12,2^n} - t_{20,2^n}\right) = jal_{2n+2} - 1$

Proof

$$4\left(2t_{12,2^n} - t_{20,2^n}\right) = 4\left(2^{2n}\right)$$

$$4\left(2t_{12,2^n} - t_{20,2^n}\right) = jal_{2n+2} - 1$$

12. The following is a Nasty number

a) $t_{20,n} - t_{8,n} + 6n$

Proof

$$t_{20,n} - t_{8,n} = 9n^2 - 8n - 3n^2 + 2n$$

$$= 6n^2 - 6n$$

b) $6\left(t_{58,n} - 3t_{20,n} - 3n\right)$

Proof

$$t_{58,n} - 3t_{20,n} = 28n^2 - 27n - 27n^2 + 24n$$

$$t_{58,n} - 3t_{20,n} - 3n = n^2$$

c) $6\left(\dfrac{t_{20,n} - t_{16,n} + n}{t_{6,n}}\right)$

Proof

$$\frac{t_{20,n} - t_{16,n} + n}{t_{6,n}} = \frac{2n^2 - n}{2n^2 - n}$$

d) $6\left(t_{8,n} - t_{24,n} + t_{20,n}\right)$

Proof

$$t_{8,n} - t_{24,n} + t_{20,n} = 3n^2 - 2n - 2n^2 + 2n$$

$$= n^2$$

e) $t_{20,n} - 3ct_{3,n} + 15n - 2g_n$

Proof

$$t_{20,n} - 3ct_{3,n} = 6n^2 - 15n + 4n - 2$$

$$= 6n^2 - 15n + 2(2n-1)$$

$$t_{20,n} - 3ct_{3,n} + 15n - 2g_n = 6n^2$$

f) $\left(t_{20,n} * 2t_{3,n}\right) - 9_{n^2} - 2p_n^5 + 24n^2$

Proof

$$t_{20,n} * 2t_{3,n} = 9n^4 + n^3 - 8n^2$$

$$= 9\left[\left(n^2\right)^2 + n^2\right] + \left(n^2 + n^3\right) - 18n^2$$

$$\left(t_{20,n} * 2t_{3,n}\right) - 9_{n^2} - 2p_n^5 + 24n^2 = 6n^2$$

13. $\left(t_{20,n} * t_{6,n}\right) + 7n = 36t_{3,n^2} - 30p_n^7 + 2t_{7,n}$

Proof

$$\left(t_{20,n} * t_{6,n}\right) = 18n^4 - 25n^3 + 8n^2$$

$$= 18\left(n^4 + n^2\right) - 5\left(5n^3 + 3n^2 - 2n\right) + \left(5n^2 - 3n\right) - 7n$$

$$\left(t_{20,n} * t_{6,n}\right) + 7n = 36t_{3,n^2} - 30p_n^7 + 2t_{7,n}$$

14. $n\left(t_{20,n} + 4g_n\right) = 3cp_n^{14} + 2cp_n^6$

Proof

$$n\left(t_{20,n} + 4g_n\right) = 9n^3 - 4n$$

$$= 7n^3 - 4n + 2n^3$$

$$n\left(t_{20,n} + 4g_n\right) = 3cp_n^{14} + 2cp_n^6$$

15. $t_{20,n} - t_{14,n} = t_{24,n} - t_{18,n}$

Proof

$$t_{20,n} - t_{14,n} = 3n^2 - 3n$$

$$t_{24,n} - t_{18,n} = 3n^2 - 3n$$

$$t_{20,n} - t_{14,n} = t_{24,n} - t_{18,n}$$

16. $t_{20,n} + 1 = s_n + t_{8,n}$

Proof

$$t_{20,n} = 9n^2 - 8n$$

$$= \left(6n^2 - 6n + 1\right) + \left(3n^2 - 2n\right) - 1$$

$$t_{20,n} + 1 = s_n + t_{8,n}$$

17. $n\left(t_{20,n} + 1\right) + t_{24,n} = 6p_n^{10} + 3cp_n^{10} - 6cp_n^4$

Proof

$$nt_{20,n} + t_{24,n} = 9n^3 + 2n^2 - 10n$$

$$= \left(8n^3 + 3n^2 - 5n\right) + \left(5n^3 - 2n\right) - 2\left(2n^3 + n\right) - n$$

$$n\left(t_{20,n} + 1\right) + t_{24,n} = 6p_n^{10} + 3cp_n^{10} - 6cp_n^4$$

18. $n\left(18p_n^5 - t_{20,n}\right) - 17n^2 = 108F_{4,n,4}$

Proof

$$n\left(18p_n^5 - t_{20,n}\right) = 9n^4 + 8n^2$$

$$= 9\left(n^4 - n^2\right) + 17n^2$$

$$n\left(18p_n^5 - t_{20,n}\right) - 17n^2 = 108F_{4,n,4}$$

19. $t_{20,n} + p_n^{14} + 3n = 6p_n^6 + t_{34,n}$

Proof

$$t_{20,n} + p_n^{14} = 9n^2 - 8n + \frac{4n^3 + n^2 - 3n}{2}$$

$$= \left(4n^3 + 3n^2 - n\right) + \left(16n^2 - 15n\right) - 3n$$

$$t_{20,n} + p_n^{14} + 3n = 6p_n^6 + t_{34,n}$$

20. $4t_{20,n} = t_{38,n} + t_{18,n} + t_{22,n} + n$

Proof

$$2t_{20,n} = t_{38,n} + n \quad (1)$$

$$2t_{20,n} = t_{18,n} + t_{22,n} \quad (2)$$

Add (1) and (2), we get

$$4t_{20,n} = t_{38,n} + t_{18,n} + t_{22,n} + n$$

21. $t_{58,n} - t_{40,n} + n = t_{20,n}$

Proof

$$t_{58,n} - t_{40,n} = 9n^2 - 9n$$

$$= t_{20,n} - n$$

$$t_{58,n} - t_{40,n} + n = t_{20,n}$$

22. $\left(t_{20,n} * g_n\right) + 4n = 6cp_n^{18} - t_{52,n}$

Proof

$$\left(t_{20,n} * g_n\right) = 18n^3 - 25n^2 + 8n$$

$$= 6\left(3n^3 - 4n\right) - \left(25n^2 - 24n\right) - 4n$$

$$\left(t_{20,n} * g_n\right) + 4n = 6cp_n^{18} - t_{52,n}$$

REFERENCES

[1.] Beiler A. H., Ch.18 in Recreations in the Theory of Numbers, The Queen of Mathematics Entertains, New York, Dover, (1996), 184-199.

[2.] Bert Miller, Nasty Numbers, The Mathematics Teachers, 73(9), (1980), 649.

[3.] Bhatia B.L., and Mohanty Supriya, Nasty Numbers and their characterization, Mathematical Education, I (1), (1985), 34-37.

[4.] Bhanu Murthy T.S., Ancient Indian Mathematics, New Age International Publishers Limited, New Delhi, (1990).

[5.] Conway J.H., and Guy R.K., The Book of Numbers, New York Springer – Verlag, (1996), 44-48.

[6.] Dickson L.E., History of the Numbers, Chelsea Publishing Company, New York, (1952).

[7.] Meyyappan M., Ramanujan Numbers, S.Chand and Company Ltd., First Edition, (1996).

[8.] Horadam A.F., Jacobsthal Representation Numbers, Fib. Quart., 34,(1996), 40-54.

[9.] Shailesh Shirali, Primer on Number Sequences, Mathematics Student, 45(2), (1997), 63-73.

[10.] Gopalan M.A., and Devibala S., "On Lanekal Number", Antarctica J. Math, 4(1), (2007), 35-39.

[11.] Gopalan M.A., Manju Somanath, and Vanitha N., "A Remarkable Lanekel Sequence", Proc. Nat. Acad. Sci. India 77(A), II(2007), 139-142.

[12.] Gopalan M.A., Manju Somanath, and Vanitha N., "On R_2 Numbers", Acta Ciencia Indica, XXXIIIM(2), (2007), 617-619.

[13.] Gopalan M.A., and Gnanam A., "Star Numbers", Math. Sci. Res.J., 12(12), (2008), 303-308.

[14.] Gopalan M.A., and Gnanam A., "A Notable Integer Sequence", Math. Sci.Res. J., 1(1) (2008) 7-15.

[15.] Gopalan M.A., and Gnanam A., "Magna Numbers", Indian Journal of Mathematical Sciences, 5(1), (2009), 33-34.

[16.] Gopalan M.A., and Gnanam A., "Four dimensional pyramidal numbers", Pacific Asian Journal of Mathematics, Vol-4, No-1, Jan-June, (2010), 53-62.

Highly Efficient Motorized Screw Jack

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ABSTRACT :

Power screws are used to convert rotary motion into translatory motion. A screw jack is an example of a power screw in which a small force applied in a horizontal plane is used to raise or lower a large load. The principle on which it works is similar to that of an inclined plane. The mechanical advantage of a screw jack is the ratio of the load applied to the effort applied. The screw jack is operated by turning a lead screw. The effort required to rotate the screw can be eliminated by using a 12V DC motor to rotated screw of jack; which facilitate in easy replacement of tyre. Advantage of this system is that it draws the energy from the battery of vehicle. For torque multiplication; generated by motor two spur gear are used. A small gear is mounted on motor shaft and a large spur gear on power screw of jack. Also we are looking for to increase the efficiency of motorized screw jack by varying helix angle by which energy drawn by motor can be decrease.

Keywords: *D.C motor, Power screw, Lifting Arm, Gear & pinion, speed reduction.*

I. INTRODUCTION

The motorized screw jack has been developed to cater to the needs of small and medium automobile garages, which are normally man powered with minimum skilled labor. In most of the garages the vehicles are lifted by using screw jack. This needs high man power and skilled labour. In order to avoid all such disadvantages, the motorized jack has been designed in such a way that it can be used to lift the vehicle very smoothly without any impact force. The operation is made simple so that even unskilled labour can use it with ease.The d.c motor is coupled with the screw jack by gear arrangement. The screw jack shafts rotation depends upon the rotation of D.C motor. This is a simple type of automation project. The operation remains to be an essential part of the system although with changing demands on physical input, the degree of mechanization is increased.

II. PRINCIPLE OF WORKING

2.1 Torque Requirement- Lifting Load

The screw is considered as an inclined plane with inclination α.When the load is being raised, following forces act at a point on this inclined plane:

2.1.1 Load *W*: It always acts in vertically downward direction.

2.1.2 Normal reaction N: It acts perpendicular (normal) to the inclined plane.

2.1.3 Frictional force μN: Frictional force acts opposite to the motion. Since the load is moving up the inclined plane, frictional force acts along the inclined plane in downward direction.[2]

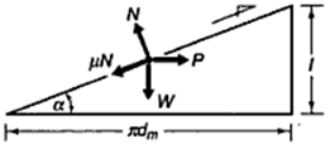

Fig. 2.1

2.1.4 Effort P: The effort P acts in a direction perpendicular to the load W.It may act towards right to overcome the friction and raise the load.

For an equilibrium of horizontal forces.[2]

$$P = \mu N \cos \alpha + N \sin \alpha \quad (a)$$

For an equilibrium of vertical forces,

$$W = N \cos \alpha - \mu N \sin \alpha \quad (b)$$

Dividing expression (a) by (b),

$P = \frac{W(\mu \cos\alpha + \sin\alpha)}{(\cos\alpha - \mu \sin\alpha)}$ [5] (c)

The coefficient of friction μ is expressed as,

$\mu = \tan\theta$ (d)

Where θ is the friction angle.

Substituting $\mu = \tan\theta$ in Eq. (c),

$P = \frac{W(\tan\theta + \tan\alpha)}{(1 - \tan\theta \tan\alpha)}$ [5]

Or $P = W \tan(\theta + \alpha)$ (e)

The torque"T" required to raise the load is given by,

$T = \frac{Pd_m}{2}$

$T = \frac{Wd_m}{2}\tan(\theta + \alpha)$ [5] (f)

2.2 Torque Requirement Lowering Load-

When the load is being lowered, the following forces act at a point on the inclined plane:

2.2.1 Load W: It always acts in vertically downward direction.

2.2.2 Normal reaction N: It acts perpendicular (normal) to the inclined plane.

2.2.3 Frictional force μN: Frictional force acts opposite to the motion. Since the load is moving down the inclined plane, frictional force acts along the inclined plane in upward direction.

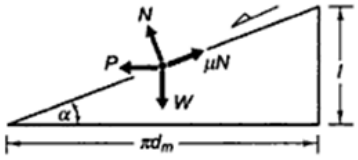

Fig. 2.2

2.2.4 Effort P: The effort P acts in a direction perpendicular to the load W.It should act towards left to overcome the friction and lower the load.

For an equilibrium of horizontal forces,

$P = \mu N \cos\alpha - N \sin\alpha$ (a)

For an equilibrium of vertical forces,

$W = N \cos\alpha + \mu N \sin\alpha$ (b)

Dividing expression (a) by (b),

$P = \frac{W(\mu \cos\alpha + \sin\alpha)}{(\cos\alpha - \mu \sin\alpha)}$ [1]

Dividing the numerator and denominator of the right hand side by cos α,

$P = \frac{W(\mu - \tan\alpha)}{(1 + \mu \tan\alpha)}$ [1] (c)

The coefficient of friction μ is expressed as,

$\mu = \tan\theta$ (d)

Substituting $\mu = \tan\theta$ in Eq. (c),

$P = \frac{W(\tan\theta - \tan\alpha)}{(1 + \tan\theta \tan\alpha)}$

or $P = W \tan(\theta - \alpha)$ (e)

The torque „T" required to raise the load is given by,

$T = \frac{Pd_m}{2}$

III. SYSTEM DESIGN

3.1 Measurement of Angle –

$25 + 160\sin\theta + 160\sin\theta + 25 = 210$

$\sin\theta = \frac{1}{2}$

or $\theta = 30^{\circ}$ Where, 25mm is height of base and upper support.

160mm is length of arm.

210mm is ground clearance of vehicle.

θ is inclination of arm at minimum position.

3.2 Design of screw –

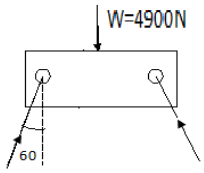

Fig. 3.1.

$\sum F_y$=0

Pcos 60 °+ Pcos 60 ° =4900

P=4900/2cos 60 =4900 N

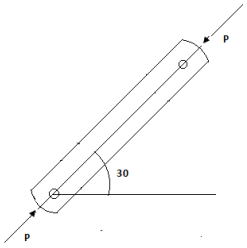

Fig. 3.2

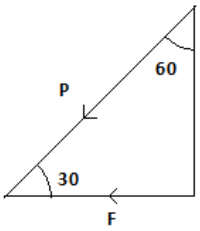

Fig. 3.3

From figure (3.3)

Psin 60=F

F=4900*sin 60 =4900*0.5

F=4243.52N

This is the tension in screw due to one nut. Therefore tension in screw due to both nut.

W_1 = 2F = 2*4243.52 =8487.048N

Let material for screw is C50 for which [5]

σ_{yp} =392 N/mm^2 , τ =147 N/mm^2 [2]

Design stress $S_d = \frac{S'_e}{nk} = \frac{e_{s2}S_e}{nk} = \frac{392}{2.5*1.6}$ [2]

F.s. ⇒n=2.5 ,e_{s2}=1.5, K=1.6

Now

Total tension = $\frac{\pi}{4}(d_c)^2 \sigma_t$ [2]

∵ Screw is designed for design stress S_d

∴ Put $\sigma_t = S_d$

$W_1 = \frac{\pi}{4}(d_c)^2 S_d$ or 8487.048 = $\frac{\pi}{4}(d_c)^2 * 98$

d_c =10.5007 mm Say d_c=12mm standard size.

Area of core = $\frac{\pi}{4}(d_c)^2 = \frac{\pi}{4}(12)^2$ = 113 mm^2 [5]

Corresponding to this area nominal dia can be selected from [5]

Nominal dia or outer dia

d_o =14 mm

$d_{mean} = \frac{d_c+d_o}{2} = \frac{12+14}{2}$ = 13mm

d =13mm and Pitch = 3mm By Survey

$\tan\alpha = \frac{p}{\pi d}$ or $\tan\alpha = \frac{3}{\pi*13}$ 0.073

Effort required to rotate screw

$P = W_1 \tan(\alpha+\varphi)$ [5]

$W_1 = \frac{\tan\alpha+\tan\varphi}{1-\tan\alpha\tan\varphi}$, $\tan\varphi$=0.18 [1]

According to max shear stress theory [3]

Max shear stress in simple tension at elastic limit

$= \frac{1}{2}\sigma_t = \frac{1}{2}$ *392 = 196 N/mm^2

Shear stress due to torque = 59.62 N/mm^2

Calculated value is less then design Stress . Hence design is Safe

Length olf screw = 210+ 2*14 =238 mm

$= 8487.048 * \frac{0.073+0.18}{1-0.073*0.18} = 8487.048 * 0.258 = 2175.81$ N

Torque $T_o = P * \frac{d}{2}$

$= 2175.81 * \frac{13}{2} = 14142.78$ Nmm or $T_o = 14.142$ Nm

$\eta_{max} = \frac{1-\sin\phi}{1+\sin\phi}$ [2]

$\because \tan\phi = 0.18$ or $\phi = 10.2$

$\eta = \frac{1-\sin 10.2}{1+\sin 10.2}$ or $\eta = 69.9\ \%$

$\eta = \frac{T_o}{T}$ or $T = \frac{14.142}{0.699}$

T = 20.2313Nm

Shear stress in screw due to torque

$= \frac{16T}{\pi(d_c)^3} = \frac{20231.34*16}{\pi(12)^3}$

$\tau = 59.628$ N/mm^2

We know that

$\sigma_t = \frac{W_1}{\frac{\pi}{4}(d_c)^2} = \frac{8487.048}{\frac{\pi}{4}(12)^2}$ [5]

$\sigma_t = 75.04$ N/mm^2

Max principal stress $\sigma_{t(max)} = \frac{\sigma_t}{2} + \frac{1}{2}\sqrt{\sigma_t^2 + 4\tau^2}$

$\sigma_{t(max)} = \frac{59.628}{2} + \frac{1}{2}\sqrt{(75.04)^2 + 4*(59.628)^2}$

$= \frac{59.628}{2} + \frac{140.90}{2}$

$\sigma_{t(max)} = 100.264$ N/mm^2 For material 392 N/mm^2

FOS = $\frac{392}{100.26} = 3.9$

Check Bending stress –

$I = \frac{1}{12}\pi d_c * (\frac{p}{2})^3$ and $Sy = \frac{p}{4}$

$\frac{M}{I} = \frac{\sigma_b}{y}$ or $\sigma_b = \frac{M}{I} * y$

$\sigma_b = \frac{\frac{W_1 l}{i}}{\frac{1}{12}\pi d_c (\frac{p}{2})^3} * \frac{p}{4}$ or $\sigma_b = \frac{8487.048 * \frac{1.5}{15}}{\frac{1}{12}\pi d_c (\frac{3}{2})^3} * \frac{3}{4}$

$\sigma_b = \frac{848.7048}{10.6029} * \frac{3}{4}$ or $\sigma_b = 60.034$ N/mm^2

Which is less than design stress.

3.3 Design of nut-

Bearing pressure in screw $p_b = 14$ N/mm^2 Table 19.1 Page 450 M& H

No. of Thread $i = \frac{W_1}{\frac{\pi}{4}*[d_o^2 - d_c^2]*p_b}$ or $i = \frac{8487.048*4}{\pi*[14^2-12^2]*14} = 14.843 \approx 15$

Length of nut = i* p = 15*3 = 45 mm [2]

outside dia of nut = $2d_c$ =2*12= 24mm [2]

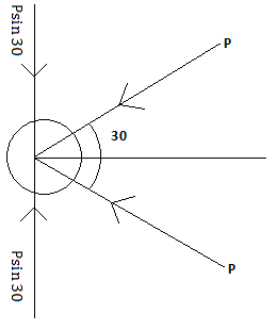

Fig. 5.4

from figure –

$\sum F_y = P\sin 30 - P\sin 30 = 0$

$\sum F_x = P\cos 30 + P\cos 30$

$= 4900*\cos 30 + 4900*\cos 30 = 8487.048$ N

$R = \sqrt{F_x^2 + F_y^2} = \sqrt{8487.048^2}$

=8487.048 N

Check for shear

$\tau = i * \pi\ dc * (\frac{n}{2}) * \sigma_s$ = 15* π * 12* $\frac{3}{2}$ * 147 = 124.689 * 10^3 N

Or = 124.689 KN

Since calculated value is greater than actual load on nut (8487.048 N)

Hance design is safe.

3.4 Design of pin –

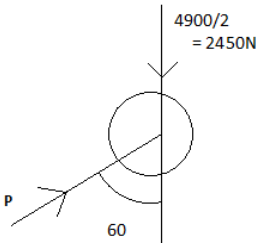

Fig. 5.5

P = 4900N

$\sum F_y$ = P cos 60 − 2450

= 4900*0.5 -2450 =0

$\sum F_x$ = P sin 60

= 4900 sin 60 = 4243.52N

R = $\sqrt{0^2 + 4243.52^2}$ = 4243.52 N

Let dia of pin = d_1

4243.52 = 2 * $\frac{\pi}{4}\ {d_1}^2 * \tau$ or $\frac{4243.52*2}{\pi} = {d_1}^2 * 147$ or $d_1 = 4.2869$ mm

Dia of pin head = 1.5 d_1

= 1.5* 4.286 = 6.429 mm

3.5 Design of links:

Material for link is plain carbon steel,C=1.00 to 1.15

Now $\sigma_c = \frac{\sigma_{yp}}{F.S.} = \frac{563}{3.5}$ =160.857 ($\sigma_{yp=563MPa}$)

Load o links = F/2

=563/2 =2121.76

Assuming a factor of safety = 3.5 the link must be designed for a buckling load,

W_{cr} = 2121.76*3.5 =7426.16N

Let $t_{1=}$ thickness of the link and

$b_{1=}$ width of the link

Assuming the width of the link is three times the thickness of the links i.e. b=3t_1

A = t_1*3t_1 = 3t_1^2

Moment of inertia I = $\frac{1}{12} * t_1 * b_1^3$ = $\frac{1}{12} * t_1 * (3t_1$ = 2.25t_1^4

Since for buckling of the link in the vertical plane,the ends are considered as hinged,therefore,

Equivalent length of link, L = 160

Rankine constant ,a=1/7500

$W_{cr} = \sigma_c$*A/1+a$(L/K)^2$

7426.16 = $\frac{160.857*3*t_1^2}{1+\frac{1}{7500}*(\frac{160}{0.866t_1})^2}$ or 7426.16 + $\frac{33799.26}{t_1^2}$ - 482.55* t_1^2 = 0

482.55 * t_1^4 - 7426.16 * t_1^2 - 33799.26 = 0

t_1 = 19.063mm t_1=4.366mm

I = $\frac{1}{12}$ * b_1 * $(t_1)^3$ = $\frac{1}{12}$ * 3t_1* t_1^3 = 0.25t_1^4

A = t_1*b_1= $t_1 * 3t_1$ = 3t_1^2

K = $\sqrt{\frac{I}{A}}$ = $\sqrt{\frac{0.25t_1^4}{3t_1^2}}$ = 0.29t_1

Equivalent length L=l/2=160/2=80mm

$W_{cr} = \frac{\sigma_c A}{1+a(L/K)^2}$ $= \frac{563*3*(4.366^2)}{1+\frac{1}{7500}*(\frac{80}{0.29*4.366})^2}$ $= \frac{32195.64}{1.53229}$ = 21011.453N

Since calculated value is greater than the actual value, so design is safe.

3.6 Design of gear –

The allowable static static stress for gear is made of cost iron and pinion of steel are 60MPa & 105 MPa respectively.

$\phi = 20$ involute T_P= 16

V.R = T_G / T_P =3:1

σ_{OG}= 60 MPa σ_{OP} = 105 MPa

Pitch line velocity

$V = \frac{\pi D_p N_p}{60} = \frac{\pi m T_P N_p}{60}$

$= \frac{\pi m*16*300}{60}$ = 251m mm/s = 0.251mm/s

Service factor C_s = 0.8

$W_T = \frac{p}{v} * C_s = \frac{0.34*10^3}{0.251m} * 0.8 = \frac{9.322*10^3}{m}$ N

Velocity factor $C_v = \frac{4.5}{4.5+V}$

$= \frac{4.5}{4.5+0.251m}$

$Y_p = 0.154 - \frac{0.912}{T_p} = 0.154 - \frac{0.912}{16} = 0.097$

$Y_G = 0.154 - \frac{0.912}{T_G} = 0.154 - \frac{0.912}{3*16} = 0.135$

$\sigma_{OP} * Y_P = 105 * 0.097 = 10.185$

$\sigma_{OG} * Y_G = 60 * 0.135 = 8.1$

Since $\sigma_{OG} * Y_G < \sigma_{OP} * Y_P$

Design tangential tooth load

$W_T = \sigma_{WG}\, b\pi\, m\, Y_G = \sigma_{OG}\, C_V\, b\pi\, m\, Y_G$

$\frac{9.322*10^3}{m} = 60\,(\frac{4.5}{4.5+0.251m}) * 14m*\pi\, m*0.135$

$\frac{9.322*10^3}{m} = (\frac{4.5687.0663m^2}{4.5+0.251m})$

$4.5 + 0.251m = 00737m^3$

m= 4.23 By hit & trial method

Face width

b = 14m = 14* 4.23 = 59.22mm

Pitch diameter of pinion

$D_p = m\, T_p$ = 4.23*16 = 67.68mm

Pitch dia of gear

$D_G = m\, T_G$ =203mm

check the gears for wear

we know that the ratio factor

$Q = \frac{2V.R}{VR+1} = \frac{2*3}{3+1}$ = 1.5

load stress factor $K = \frac{(\sigma_{es})^2 \sin\phi}{1.4}(\frac{1}{E_P}+\frac{1}{E_G})$

$= \frac{(600)^2 \sin 20}{1.4}(\frac{1}{200*10^3}+\frac{1}{200*10^3})$ = 0.44 + 0.88 = 1.32N/mm^2

We know that the maximum or limiting load for wear

$W_w = D_p bQK$ =67 *59.22*1.5*1.32 =7856.1252N

Tangential load on the tooth

$W_T = \frac{9.322 * 10^3}{m} = \frac{7856.1252}{4.23}$ = 1857.24 N

Since the maximum wear load is much more than tangential load on the tooth , therefore the design is satisfactory from the standpoint of wear .

IV. CONCLUSION

Screw Jacks are the ideal product to push, pull, lift, lower and position loads of anything from a couple of kg to hundreds of tones. The need has long existed for an improved portable jack for automotive vehicles. It is highly desirable that a jack become available that can be operated alternatively from inside the vehicle or from a location of safety off the road on which the vehicle is located. Such a jack should desirably be light enough and be compact enough so that it can be stored in an automobile trunk, can be lifted up and carried by most adults to its position of use, and yet be capable of lifting a wheel of a 400-500 kg vehicle off the ground. Further, it should be stable and easily controllable by a switch so that jacking can be done from a position of safety. It should be easily movable either to a position underneath the axle of the vehicle or some other reinforced support surface designed to be engaged by a jack.

Thus, the product has been developed considering all the above requirements. This particular design of the motorized screw jack will prove to be beneficial in lifting and lowering of loads.

REFERENCES

Journal Papers:

[1] Lokhande Tarachand G. ,Chatpalliwar Ashwin S. And Bhotar Amar A.," Optimizing Efficiency of Square Threaded Mechanical Screw Jack by Varying Helix Angle", International Journal of Modern Engineering Research (IJMER)(Vol.2, Issue.1, Jan-Feb 2012) 504-508 ISSN: 2249-

Books:

[2] Bhandari, V.B.(2010)," Design of machine elements", Tata McGraw-Hill Education.

[3] Khurmi, R.S. and Gupta, J.K. (2005), "A Textbook of Machine Design", Eurasia Publishing House (P.V.T) Ltd.14th Edition, 1230 pp. ISBN: 81 - 219 -2537 – 1.

[4] Bansal, R.K (2012), "Strength of Materials" Revised Edition , LAXMI PUBLICATION(P) LTD.

[5] Rajput, R.K. (2010), "Strength of Materials" Revised Edition , S. Chand and Company Limited. 1448 pp ISBN 81-219-2594-0.

[6] Shariff, Abdulla (2010),"Hand Book of properties of Engineering Materials and Design Data For Machine Elements",Dhanpat Rai & Co.(P) LTD

A comparative study of Broadcasting Protocols in VANET

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ABSTRACT:
Vehicular Ad-hoc Network (VANET) represents a challenging class of mobile ad-hoc networks that enables vehicles to intelligently communicate with each other and with roadside infrastructure. Reliable and efficient broadcasting in vehicular ad hoc networks is one of the keys to success for services and applications on intelligent transportation system. Many protocols have been introduced but none of them has been evaluated in realistic scenario. In this research, we discuss the reliable broadcasting protocols such as Distance Based Routing (DBR), Street cast and Acknowledgement-Based Broadcasting Protocols (ABBP) on VANET. Then, we evaluate performance of these protocols by simulation. From simulation result, we found a performance and problem in each protocol, which can lead to broadcast storm problem and inefficient operation.

Keywords: *DBR, ABBP, Streetcast, VANET.*

I. I.INTRODUCTION

Work on the ad hoc network begins from 1970s when network were originally called packet radio networks. Inter-vehicle communications (IVC) and Roadside-to-Vehicle communication (RVC) are becoming one of the most popular research topics in wireless communications. Capability of VANET has to provide safety and traffic management: vehicles can notify other vehicles of hazardous road conditions, traffic jamming, or rapid stops [5].

VANET is formed by vehicles with wireless equipment for communication. It allows vehicles to communicate directly to each other without infrastructure deployment.

VANET is one of the special forms of mobile ad hoc networks (MANET), which gains interest from many researchers. But VANETs are different from MANETs in several ways. First, vehicles are in large volume, and network topology changes rapidly. Second, the mobility of vehicles is constrained by roads with limitations on driving speed. Although vehicles can move in high speed, their directions and speeds are predictable. Third, vehicles usually do not have tight energy budget. Instead, bandwidth issues are more critical than energy ones in VANETs [5] [7].

VANET brings up the communication solution instead of relying on infrastructure to be ready. So most of applications in Intelligent Transportation System [2] can exchange information directly with less delay. To achieve this, communication protocols must cope with the mobility of vehicles and the dynamics of wireless signals.

Broadcasting is the task of sending a message from a source node to all other nodes in the network. The two major challenges of broadcast are to ensure the reliability of messages while disseminating message over the intended regions and keeping the delay time within the requirements of the application. The design of reliable and efficient broadcast protocols is a key enabler for successful deployment of vehicular communication services. To design a reliable and efficient broadcast protocols. One should take the following metrics into considerations. The first metric is reliability; that is, a broadcast message should deliver to as many vehicles as possible. Second metric is overhead; that is, delivery of the broadcast message to all vehicles should generate as few redundant messages as possible. The last metric is speed of the data; that is, a broadcast message should be delivered to all vehicles as fast as possible. Although a broadcast message can reach all vehicles, it can be meaningless if it arrives too late. This metric is very critical for emergency services.

In VANET, several reliable broadcasting protocols have been proposed such as DBR, ABBR and STREETCAST. The details of each protocol will be discussed in further. In this paper, we compare these reliable broadcasting protocols on VANET. We then evaluate the reliable broadcasting protocols in terms of reliability, overhead and speed of data by simulation. Our simulation results show problems on each protocol [6].

This paper is organized as follows. In Section II, details of the DBR protocol is described. In Section III, details of ABBP are described. In Section IV, details of STREETCAST protocol is described. In Section V, simulation and performance evaluation are shown. Section VI has a conclusion portion [1] [6].

II. DBR PROTOCOL

In DBR, every vehicle computes the inter vehicular distance between itself and its neighboring vehicles based on the propagation delay. This distance is calculated by using the following formula.

$$D = S * T \quad (1)$$

Where D represents the inter vehicular distance, S represents the velocity and T is the propagation delay. From equation 1 that the D is directly proportional to S of the vehicle and T. Fig 1 depicts the procedure involved in determining the inter vehicular distance based on equation 1. The n1 and n2 represent two vehicles moving on road with velocity v1 and v2 respectively [3]. The vehicle n1 broadcasts position and speed information at time T0 and the vehicle n2 receives this information at time T1. Based on the information received, the vehicle n2 computes the intervehicular distance with respect to propagation delay using equation 4. The d2 represents the distance between the current positions of vehicle n1 at time T0. It is determined by equation 2. Similarly d1 as shown in equation 3 represents the distance covered by the vehicle n1 in time (T1-T0).

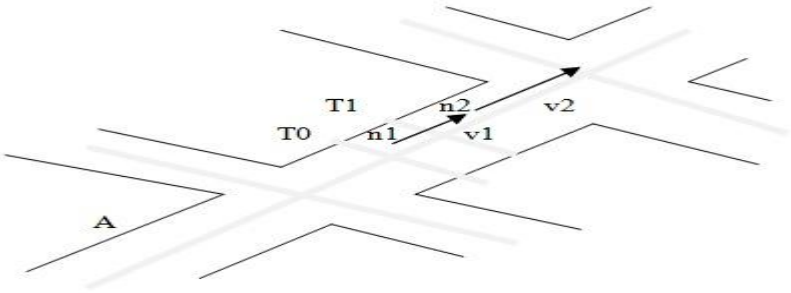

Fig 1. Calculation of intervehicular distance.

Vehicle identification number
Source X-coordinates
Source Y-coordinates
Destination X-coordinates
Destination Y-coordinates
Speed of the neighboring vehicle
Intervehicle distance

Table I: Routing Table

$$d2 = v2 * (T1-T0) \quad (2)$$
$$d1 = v1 * (T1-T0) \quad (3)$$
$$inter\_vehicular\_distance = d2 - d1 \quad (4)$$

In this approach every vehicle makes use of digital map. We suppose that digital map provides entire detail of the road network such as coordinates of intersection. All the vehicles determine its initial position using GPS technology or from users and identifies its location in the digital map. Table I represents routing table maintained by all the vehicles. The vehicles keep track of velocity and direction information. Whenever there is a change in these parameters, the vehicle will broadcast a hello message. The neighboring node which receives the hello message will updates its routing table accordingly and recomputed intervehicular distance analogous to change in velocity and also updates the vehicle ID,velocity,position information and coordinates of destination in the routing table. The size of the table depends on the traffic congestion of the road. When there is huge traffic congestion, maintaining all the vehicle information will increase the computational load. So the delay of updating and searching while forwarding the data is minimized with the help of varying table size... Then DBR forwards the data packet using both location information and vehicle ID present in the routing table.

Packet sequence number
Destination vehicle id
Next hop
Previous hop
Number hops

Table II: Data Forwarding Table

In ordered to forward the data packet, a vehicle selects the next hop based on the direction if the location of destination is known. Table II represents data forwarding table maintained by every vehicle. Before forwarding any data packet the parameters of data forwarding table associated with the data packet are stored in the table. The vehicle searches for necessary information in data forwarding table to select the next hop whenever a data packet is received [3].

III. STREETCAST PROTOCOL

This protocol comprises of three components: *relay-node selection, MRTS handshaking,* and *adaptive beacon control*. It uses two units such as Roadside Unit (RSU) and OnBoard Units (OBUs). RSU can pick up relay nodes from its one-hop neighbors and disseminate packets over specified road segments. The selected OBRs upon receiving messages disseminate packets in their forward direction. The selected OBUs will reply ACKs to ensure reliability [2].

*A. **Selection of Relay Nodes***

In order to reduce redundancy, we apply the Multi-Point Relay (MPR) broadcast strategy to reduce the number of relay nodes. Every OBU and RSU maintains the neighbor table. Each node in VANETs periodically broadcasts a "hello" beacon, which includes the node's Dislocation and timestamp. When a node receives a "hello" beacon, it checks the digital street map and updates the neighbor information to its neighbor list. A neighbor is deleted from the table if no beacons are received from it for a period of time. Then the node with the optimal distance is picked from each neighbor list as a relay node.

B. Multicast Request to Send

We use MRTS to protect from collision. With MRTS mechanism, senders can send packets to multiple receivers simultaneously without worrying about collision and hidden-terminal problems. A sender transmits an MRTS and waits for CTSs from receiver. Nodes receiving MRTS frame set their NAVs (Network Allocation Vector) if they are not the relay nodes. Only relay nodes reply CTSs to the source following the order specified in the MRTS frame. Fig 2 illustrates the MRTS frame format [2].

2	2	6	6	6	6	6	6
FC	Duration	Src	Ra1	Ra2	Ra3	Ra4	FCS

FC: Frame Control
Duration: NAV Duration
Src: Source Address
Ra1, Ra2, Ra3, Ra4: Receiver Address
FCS: Frame Check Sequence

Fig 2. MRTS Frame Format

If transmission may fail due to loss of CTSs or ACKs. According to the number of received ACKs, a source can decide whether the transmission is successful or not, and re-initiate the MRTS procedure. If no CTS are received, then the source will directly re-initiate the MRTS procedure.

C. Adaptive Beacon Control

In urban areas, there could be thousands of vehicles moving across intersections in short period of time. If each vehicle keeps sending beacons, it will cause many collisions and failures. So, this protocol uses a beacon control mechanism to adjust beacon generation rate. The main function of beacons in this approach is to find the farthest neighbor in each direction for greedy forwarding. It is not necessary to let all nodes send beacons. There should be a proper number of nodes sending beacons.

IV. ABBP PROTOCOL

It is an adaptive broadcast protocol that is suitable for a wide range of mobility conditions. The main problem that a broadcast protocol must face is its adaptability to the very different vehicular arrangements in real scenarios. It should achieve high coverage of the network at the expense of as few transmissions as possible, regardless on whether the network is extremely dense or highly disconnected[1].

ABBP is localized. Vehicles are assumed to be equipped with Global Positioning System (GPS) receivers. Periodic beacon messages are exchanged to update the vehicles' local topology knowledge. The position of the sender is included within the beacons, which suffices to calculate a CDS (Connected Dominating Set) backbone after each beacon message round. The source node transmits the message. Upon receiving the message for the first time, each vehicle initializes two lists: list R containing all nodes believed to have received the message, and list N containing those neighbors in need of the

message. Then each receiving node sets a time-out waiting period. If a node is not in the CDS, then it selects longer time-out than the nodes from the DCS, so that the latter reacts first. For each further message copy received, and its own message sent, every node updates R, N and the time-out. At the end of the time-out period, it transmits if N is nonempty. Both ways, the message is buffered until it expires. For each beacon message received, N and R are updated according to the presence or absence of acknowledgement. Nodes that are no longer one-hop neighbors are eliminated from these lists. Regardless of previous decisions, all nodes that so far received the broadcast message check whether N becomes nonempty. If so, they start a fresh time-out. In addition, acknowledgements of received broadcast messages are piggybacked to periodic beacons. Nodes that was included in R because they were believed to have the message, but did not actually get it, are later removed from R and inserted into N. This algorithm is executed for each different message. Therefore, the beacon size increases linearly with the number of simultaneous broadcasting tasks [1].

V. PERFORMANCE EVALUATION

For the purpose of performance evaluation detailed performance simulations are performed for three main VANET broadcasting protocols [7] i.e. DBR, ABBP and STREETCAST.

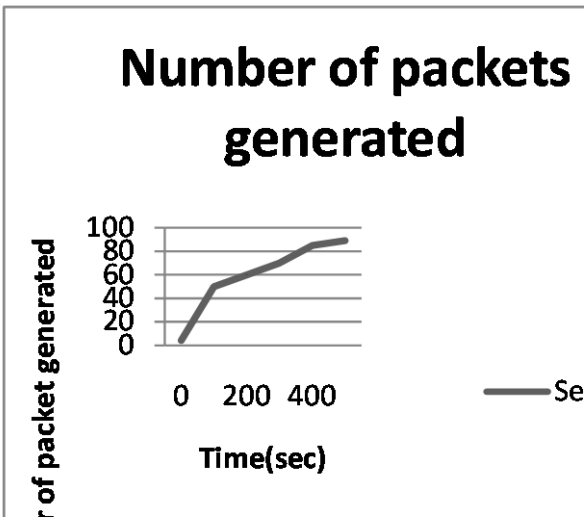

Fig. 3. Hello packets generated in unit time (DBR)

DBR is simulated using Network Simulator2 (NS2) and road map is generated using SUMO & MOVE. The simulation was carried out for duration of 500 seconds over an area of 1000sq. meters, with the varying traffic density of 100vehicles to 600vehicles. As indicated in Fig. 3 the number of hello messages generated directly depends on the number of vehicles and frequency of change in their velocity. Therefore, when compared to the traditional approach, it facilitates in reducing the number of hello messages involving periodic broadcast. And in this approach, the changes in the velocity of the vehicle do not affect the hop count because this approach selects the forwarding vehicle based on stability of velocity of the vehicle. The inter vehicular distance increases with increasing speed. In DBR, the next hop is selected from both routing table and forward data table depending on the vehicle speed and inter vehicular distance, so that the connectivity with the next hop is maintained for a longest duration [1].

In order to evaluate the performance of the Street cast, we use the GloMoSim 2.03 simulator, which is an event driven simulator. In Street cast approach, all nodes (OBUs, RSUs) have the same transmission and collision range with r=80m.

PARAMETRES	DBR	ABBP	STREET CAST
Transmission Range	250m	250m	80m
Vehicle Speed	100m/sec	50-80km/hr	30 – 50km/hr
Simulation Time	500s	120s (after steady state)	100s
Beacon Signal	Whenever change in velocity and direction parameter beacon signal is broadcasted	After source will send the message	Periodically broadcast the beacon signal
Preferred node selection	Based on the inter_vehicular distance.	Nodes within the CDS	Nodes with the optimal distance
Beaconing interval	Not periodically send	Periodically send	Periodically send
Information in a beacon message	Position of the vehicle, speed of the vehicle and destination coordinates.	Position of the sender, acknowledgement	Node's ID, location and timestamp
No of vehicles	100-600/ km	-	30cars/100m

Fig 4 Comparison chart of the protocols

Two nodes can directly communicate with each other if the distance between them is less than the transmission radius r=80m. The average traffic flow evaluated from the statistic data is about 30cars/100meters. All cars are deployed in the map based on the Poisson distribution with random speed between 30km/hr~50km/hr and turn into different direction at intersections with equal probability. Each RSU periodically broadcasts packets to the specific coverage area. Street cast has a higher delivery ratio than other protocols. Because the MRTS protects wireless communications and selects relay nodes to reduce the redundancy and provide reliability. However, the delivery ratio becomes lower as the increasing of the packet generation rate.

ABBP is simulated using Network Simulator2 (NS2). The simulation was carried out for duration of 120 seconds. The broadcast message contains 500bytes of payload. In order to create highway and suburban scenarios, as well as to generate the mobility traces of the vehicles, we have employed the SUMO microscopic road traffic simulation package. This allows us to simulate common vehicular situations such as overtakes and stops at intersections. This leads to intermittent connectivity and uneven distribution of vehicles. In each scenario, we defined several routes which are followed by the vehicles. In order to get a wide range of network connectivity, we have varied the traffic injection rate per route from 1/75 to 1/5 vehicles per second. The higher the traffic injection, the higher the network density. Maximum speed allowed in this approach is 50 and 80km/hr. ABBP is more efficient approach. In any case, ABBP behaves very well when compared to the other approaches.it provides high reliability for broadcasting in highways because it is based upon the DS-NES forwarding framework, which is meant to cover the whole network. The lowest reliability offered by this scheme is the 94.1 percent of the vehicles that could have received the message. Furthermore, the number of broadcast messages issued by ABBP is almost constant with respect to the simulated traffic flow rate. This indicates the suitability if ABBP as a scalable solution for broadcasting in highways and urban roads. It takes the advantage of the piggybacked acknowledgements to reduce the protocol redundancy. Fig.2 describes the advantage of each protocol.

Advantage of DBR Protocols:
• **It locates the neighboring in digital map using the velocity information even though an error occurs in position information obtained by GPS.** • **Avoids periodic broadcast of hello message.** • **Deals with challenges of both rural and urban road environment.**

Advantage of ABBP Protocol:
• **It is very robust and reliable protocol that extremely reduces the number of transmission needed to complete the broadcasting task.** • **This algorithm is delay tolerant in nature; it does favor low delivery latencies.**

Advantage of STREETCAST Protocol:
• **It has higher delivery ratio.**

Fig. 5 Advantage of each protocol

VI. CONCLUSION

In this paper the characteristics of the Vehicular Ad-Hoc Networks were discussed and explained how it is differ from the Mobile Ad-Hoc Networks. Then characteristics of broadcasting protocols used in VANET such as DBR, ABBP and STREETCAST were discussed and their working procedure was explained. In the performance evaluation section, performance of each protocol was discussed and advantage of each protocol was explained. However, there are many challenges to be faced in the broadcasting protocols of VANETs. A central challenge is the development of the dynamic broadcasting protocol that can efficiently perform the communication between vehicles even though they change their speed, direction frequently. Also, in order to analyze and improve the existing or new VANET broadcasting protocols, it is desirable to examine other metrics such as power consumption, fault tolerance, jitter ect.in various traffic models [6].

REFERENCES

[1] "Acknowledgement-Based Broadcast Protocol for reliable and efficient data dissemination in Vehicular Ad Hoc Networks", Francisco Javier Ros, Pedro Miguel Ruiz, Member, IEEE, and Ivan Stojmenovic, Fellow, IEEE.

[2] "STREETCAST: An Urban Broadcast Protocol for Vehicular Ad Hoc Networks", Chih-Wei Yi, Yi-Ta Chuang, Hou-Heng Yeh, Yu-Chee Tseng and Pin-Chuan Liu Department of Computer Science, National Chiao Tung University, Taiwan.

[3] "DBR: Distance Based Routing Protocol for VANETs", Ramakrishna M.

[4] D.Reichardt, M.Miglietta, P.M.L.Moretti, and W.Schulz, CarTALK 2000 – Safe and Comfortable Driving Based upon Inter-vehicle Communication, in IEEE Intelligent Vehicle Symposium, June 2002, vol. 2.2002.

[5] H.Hartenstein and K.Laberteaux, "A Tutorial Survaey on Vehicular Ad Hoc Networks", IEEE Comm. Magazine, vol. 46, no. 6, pp. 164-171, June 2008.

[6] M.Sichitiu and M.Kihl, "Inter-Vehicle Communication Systems: A Survey", IEEE Comm. Surveys and Tutorials, vol. 10, no. 2, pp. 88-105, May-Aug. 2008.

[7] O.Tonguz, N.Wisitpongphan, F.Bai, P.Mudalige, and V.Sadekar, "Broadcasting of VANET", Proc. Mobile Networking for Vehicular Environments, May 2007

Recommendation Systems: a review

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ABSTRACT

This article presents an overview of recommendation systems and illustrates the present generation of recommendation techniques that are usually categorized into the following three main classes: Collaborative Filtering (CF), Content-Based Filtering (CBF), and Hybrid Recommendation approaches. This paper also describes several weaknesses of current recommendation techniques.

Keywords: *Recommender systems, Collaborative Filtering, Content-Based Filtering, Hybrid approach*

I. INTRODUCTION

Recommendation is becoming one of the most important methods to provide documents, merchandises, and cooperators to response user requirements in providing information, trade, and services that are for society (community services), whether through mobile or on the web [1].

The quantity of data and information has been increasing daily which causes overloading of information and data. At this time, finding the customers' requirements and tendencies became important as this problem changed into the big problem. One of the innovations which helped people a lot were the engines for search (search engines) and they were somewhat as a solution for this problem.

Anyway, the information could not be personalized by these engines. System developers introduced a solution for this problem that named recommendation system.

This system use to sort and filter information, data, and objects. Recommendation systems utilize users' idea of a society or community to assist for realizing effectively users' tendency and also demands in a society from a possibly onerous set of selections [2].

The main aim of recommendation system is creating significant suggestions and recommendations information, products or objects for users' society that users could interest them. For instance, book recommendation on Amazon site, Netflix that recommend movies that use recommendation systems to identify users' tendencies and subsequently, attract users more and more [3].

There are a lot of different methods and algorithms which can assist recommendation systems to create recommendations that are personalized. All of the recommendation approaches can be divided in these three categories which are very famous:

- Content-based recommending: This method suggests and recommends objects and information which are comparable in content to objects that the users have interested previously, or compared and matched to the users' characteristics.
- Collaborative Filtering (CF): Collaborative Filtering systems suggested and recommended objects and information to a user according to the history valuation of all users communally.
- Hybrid methods: Hybrid methods are a combination of Content-based recommending and Collaborative Filtering (CF) methods [3].

This paper is organized as follows: Section 2 includes a review of collaborative filtering recommender systems literature to highlight the differences among them and indicates the advantages and disadvantages of collaborative filtering. Next, Section 3 illustrates the content base filtering (CBF) and also the pros and cons of utilizing this algorithm. Section 4 explains the different types of hybrid recommendation systemFinally, the conclusion of this study is explained during Section5.

II. COLLABORATIVE FILTERING (CF)

Collaborative filtering (CF) is one of the most famous methods for categorization the objects and has proved which CF is very effective for forecasting customer precedence in choice of objects. This method or Collaborative filtering (CF) is flourished in the middle of 1990s with scattering of services which utilized recommendation systems and presented online, like Netflix, Amazon, Elsevier. Collaborative filtering (CF) is designed to work on enormous database [4].

Collaborative filtering (CF) attempt to mechanize "word-of-mouth" recommendation procedure that means the objects suggested to customer according to how customers that have similar interests, categorized these objects [7].

At first, Goldberg et al used Collaborative filtering (CF) for introducing their filtering system that gives ability to customer for explanation their e-mails and documents [5]. Other customer can ask for documents that elucidated by specific people, but recognition of these people was left to customers. Collaborative filtering (CF) methods mechanize this procedure of identification close neighbors of customer that is active.

Collaborative filtering (CF) algorithms utilize patterns which demonstrate customers' precedence and interaction for accordance them to customers share information and documents which are similar. After recognition a match that is possible, the suggestions and recommendations are generated by algorithm. The patterns which Collaborative filtering (CF) algorithms utilize for precedence can extract from customer, directly.

It is an example of Collaborative filtering (CF) that Amazon Website use where users and customers are required to sort an object from A to E. After collection implicitly or explicitly customers' opinion, the Collaborative filtering (CF) usually use matrix for rating customers' object. As it is shown in next figure, the most number of cells are vacant, Because of it is impossible for a customer to chose, buy or categorize all of the objects that are exist in a system. Collaborative filtering (CF) algorithms utilize to anticipate values for vacant cell in matrix.

	Item 1	**Item 2**	**Item 3**	**Item 4**	**Item 5**	**Item 6**	**Item 7**	**Item 8**	**Item 9**	**Item 10**
User 1	A	B	E		C		E		A	
User 2	A		B	C		E		B		D
User 3		A		D	E		C		E	B
User 4	D		C	A	E			B	D	C
User 5	B	C		D		E	A			
User 6	B	E		D	A			C	D	E

↓

	Item 1	**Item 2**	**Item 3**	**Item 4**	**Item 5**	**Item 6**	**Item 7**	**Item 8**	**Item 9**	**Item 10**
User 1	1	1	1		1		1		1	
User 2	1		1	1		1		1		1
User 3		1		1	1		1		1	1
User 4	1		1	1	1			1	1	1
User 5	1	1		1		1	1			
User 6	1	1		1	1			1	1	1

Figure 1: Two instances of users' object matrix which includes ten objects and six users.

Collaborative filtering (CF) algorithms usually separated into two parts:

- Model-based algorithm.
- Memory-based algorithm.

1.1. Memory-based Collaborative Filtering

Another name of the algorithms of Memory-based is lazy recommendation algorithms. They postpone the calculative attempts for forecasting a customers' precedence for an object to the time that customers ask for a collection of recommendations.

The training stage of algorithm of memory-based includes storing the entire customers' ranking into memory.

There are two different memory-based recommendations that are according to k-Nearest neighbor algorithm [8]:

- Item/Object-based filtering.
- User/Customer-based filtering.

Item/Object-based filtering recommended by Sarwar et al at 2001 [9]. It mostly focuses on understanding the most similar items/objects. Items/objects are regarded for similarity when the same collection of customers has ranked or bought them highly. For every object that belongs to the customer who is active, the neighborhood of most likely objects is recognized. Every top k-neighbor is put on a list of applicants together with its likeness to the object of user who is active. The scores of similarity of objects that happening several times in applicant list are sum. The applicant list is categorized on these accumulated likenesses scores and the top N suggestions and recommendations are presented to customer [9, 10].

User/Customer-based filtering match the customer/user who is active versus the ranking matrix for finding the neighbors of active customer with which user that is active have a past concurring. At first, all of the neighbors identify, the entire object in profile that are belonging to the neighbors which are strange for customer that is active are regarded as suggestion and recommendation that are possible and classified in the neighborhood by their frequency. A rate according to their value accumulate of these frequencies generate recommendations [11].

1.2. Model-based Collaborative Filtering

Another name of this model is Eager recommendation algorithms, Model-based Collaborative Filtering algorithms do majority of work that is hard in the training stage, where these algorithms build a forecasting model of problem in recommendations. Producing the suggestions or recommendations is uncomplicated and fast issue of applying the derived model [12].

Model-based Collaborative Filtering has two probabilistic model:

- Cluster Model
- Bayesian Network Model

1.2.1. Cluster Model

One of the models that is accepted for Collaborative Filtering (CF) is Cluster model. Another name of this model is multinomial mixture model where the probability is provisionally independent from membership votes in a class C variable accepting several comparatively small numbers of values that are discrete. The Cluster model idea is that there are several definite groups or kind of users that taking a collection of precedence and preferences that are common among them. In the certain classes, the precedence that are related to the different items are independent. This model explains the probability of joint probability of votes and class to a collection of marginal and conditional distribution [12].

$$\mathbf{Pr\ (C}=C1V1,C2V2,\ldots,Vn\mathbf{)= Pr\ (C}=C\mathbf{)} \qquad \mathbf{Pr\ (Vi\ |C}\ =\ C\mathbf{)}$$

The left side of this formula is observing probability of a person of specific class and a collection of votes. This model has several parameters include **Pr (C**=C**)** that is class membership probability and **Pr (Vi |C** = C**)** condition probability of votes that are estimated from a collection of users' vote training. We cannot see the variables that are located in user database then we have to use methods that can learn parameters with hidden variables for modeling.

1.2.2. Bayesian Network Model

Another model can be use for Collaborative Filtering (CF) is Bayesian Network Model with a node similar to every item that is located in domain. The states of a node are based on possible value for every item. We also have one state based on "NO VOTE" where there is not a logical interpretation for data that are lost in domains.

After that, we use an algorithm to train data for learning Bayesian Network Model and where data are lost indicate by "NO VOTE". The algorithm that is used for learning, search over different structures of model based on dependencies for every item [12].

Therefore, every item has a collection of parent items which can forecast votes very well. Every table that is related to condition probability is presented by decision tree which is coded the probabilities that are conditional for that node. The learning algorithms is more discussed in Chickering et al. at 1997 [13].

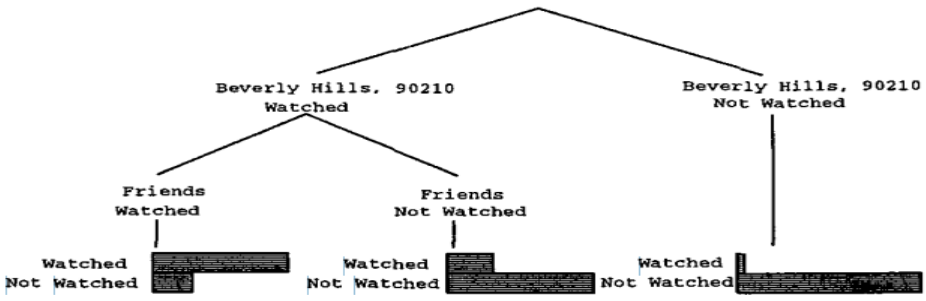

Figure 2: A decision tree for whether an individual watched "Melrose Place", with parents "Friend's", and "Beverly Hills, 90201". The bar charts at the bottom of the tree indicate the probabilities of watched and not watched for "Melrose Place", conditioned on viewing the parent programs [12].

1.3. Pros and Cons of Collaborative Filtering

Collaborative Filtering (CF) algorithms has several pros, like capability for taking an object/item quality or defect into an account when suggesting objects/items, particularly in explicit customer rankings. For example, a local music band could fall into the same genre of music a rock band that is famous in all over the world, but this item does not assurance which they have same level of quality. This subject demonstrates that objects/items identification quality is obvious pros of Collaborative Filtering (CF). Collaborative Filtering (CF) can hinder deficient suggestions and recommendation by taking the precedence of customers which are actual into an account. Second pros is which the Collaborative Filtering (CF) algorithms are particularly applicable and useful in domains where the analysis of content is very expensive or difficult, like music and film suggestion, without demanding any domain of knowledge [14].

Although the Collaborative Filtering (CF) algorithms has several pros and the quality level of Collaborative Filtering (CF) algorithms improve during the time, but the most important problem is the phase of startup in recommendation system, as there are many objects and items are provided in the system while there are few customers and few or no rankings. This problem named "cold start" and means that recommendation system cannot produce any suggestion or recommendations [15]. Remedies for solving this problem involve seeding the system by utilization other data sets, and using algorithms of recommendation system that are different in startup phase which do not suffer from "cold start" problem. Even after obtaining more ranking from customers, scantiness of the customer-object matrix can still be a problem for Collaborative Filtering (CF).

Second problem named "gray sheep" with regarding to Claypool et al. at 1999, that is a description about the hardship of recommendation system for people who are not belong to the part of an obvious group [16]. Collaborative Filtering (CF) is useful and work very well for customer and user who are fit into a particular group with a lot of neighbors that are similar [17].

Scalability is the next challenge of CF. When the number of objects and customer increase, the traditional form of Collaborative Filtering (CF) suffers critical from scalability problem. For instance, with a enormous population of customers and also big umber of objects and items, then the intricacy of Collaborative Filtering (CF) will increased. At this time, we need many systems to response urgently for online demands that we require a higher level of scalability of a Collaborative Filtering (CF).

Another challenge that Collaborative Filtering (CF) is faced is synonymy. This problem related to inclination of numerous of very similar objects to have distinctive names. Recommendation systems usually are not capable to find this problem then faced with these objects differently. For instance, "adult automobile" and "adult car" are different statement but both of them allude to the similar object. In fact, the performance of Collaborative Filtering (CF) will decrease by propagation of synonyms.

Shilling Attacks can be another challenge for recommendation systems. It means when every item or object can be ranked by every customer, in comparison with other objects that belonging to other people, customers maybe give higher rank to own objects and items or even give negative rate to competitors' products. That's why in many cases, Collaborative Filtering (CF) systems must establish safety measure to dissuade customers and users from Shilling attacks.

III. CONTENT-BASED FILTERING

The second famous recommendation algorithm is Content-based recommendation algorithms. Another name of these algorithms is content-base filtering.

These algorithms can be seen as an extended work that is performed on filtering of information [6]. Normally, the methods of content-based filtering regard to build several type of representation of content in system and then learning customers' precedence profile. Then, the representations of the content are matched opposite customers' precedence profile to discover the objects which are most related to that customer. As with Collaborative Filtering (CF), the representations of customers' precedence profile are models which are long-term, and also we can update precedence profile and this work become more available [14].

Generally, the method of recommendation by content-based filtering has problem, where representation of document must be matched to representation of customer on similarity of text or problem of machine learning when the content which is a text of representations are unified that are utilized to train an algorithm of forecasting.

There are several instances of the machine learning in Mooney and Roy at 2000 and also Lang at 1995 [18, 19].

1.4. Advantages and Disadvantage of Content-based Filtering

One of the most obvious advantages of content-based filtering algorithms is these algorithms don not need to domain of knowledge. It is adequate to gather feedback from customers about their precedence.

Next advantage of content-based filtering algorithms that we can consider to it is, these algorithms are better than Collaborative Filtering (CF) at finding locally similar objects. Because the explicit focus of content-based filtering algorithms is on similarity of text. However, this item can be a defect in domains where analysis of content in large number is impractical, impossible or difficult, like music and movies. The tendency of algorithms of content-based filtering is get stuck in a "well of similarity" [20], where they suggest objects only from a restrict theme scope. Then the recommendations that are serendipitous can be very difficult to achieve.

IV. HYBRID RECOMMENDATION SYSTEMS

Hybrid recommendation systems are adjusted for joining Content-based and Collaborative Filtering (CF) that control by one framework, and increase the benefits and also decrease the weaknesses of both techniques. Therefore, hybrid recommendation systems work on characteristics that are related to both. Indeed, there are many approaches that we can unite Content-based to Collaborative Filtering (CF). Several methods for combining Content-based to Collaborative Filtering (CF) list by Bruke at 2002 [14]. Pazzani introduced methods that discovered similitude among customers by building a content–based profile [21]. For example, Fab which recommends Web pages to its customers and users is one of hybrid recommendation systems [22]. The various hybrid recommendation systems are suggested for citation of research articles by McNee et al. at 2002 and alsoTorres et al. at 2004 [23, 24].

Several of the combination approaches that are used for building hybrid recommendation systems are as follows:

- **Mixed**: this method point to the suggestions and recommendations which are recommended from a set of various recommendation systems, are presented simultaneously.
- **Weighted**: Production a single recommendation by utilization of the votes and rates that are produce by some recommendation approaches.
- **Feature combination**: The characteristics which are relate to various recommendation data resources are get together into a single recommendation system algorithm.
- **Cascade**: One of the recommendation systems purify the suggestions and recommendations that are presented by another recommendation system.
- **Feature augmentation**: the results from one approach are utilized as input data and characteristics for another recommendation method.
- **Meta level**: the approach that is learned by one recommendation system is utilized as a input for another approach.
- **Switching**: in this method, recommendation system switches among recommendation approaches according to the current situation [14].

For example, the PTV system utilizes mixed technique to assemble a recommendation program of television viewing [25].

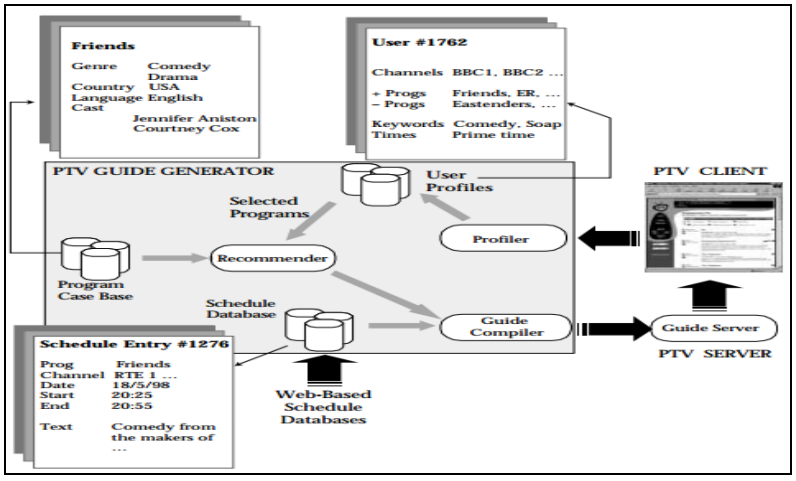

Figure 3: PTV System Architecture [25].

It employs content-based methods founded on textual descriptions of TV shows and collaborative information about the precedence of other users. Suggestions from the two methods are integrated in the final suggested program [25].

V. CONCLUSION

Accordingly, these days with technology improvement and also increasing the quantity of data we need a method and system that can help people to find their interests and their items with less effort and also with spending less time with more accurate. There are several ways that we can exploit them to reach these goals like Collaborative filtering (CF) that suggests items based on history valuation of all users communally, Content-base filtering which recommend according to previous users' precedence, and also Hybrid system that is combination of two techniques foresaid. These approaches have several advantages and disadvantages that at this research has tried to focus mostly on the recommendation approaches and their weaknesses. Although, recommendation systems with these conditions help users to find their preferences a lot they must be improved more and more.

REFERENCES

[1] Riedl, J., Jameson, A., & Konstan, J. (2004). "AI Techniques for Personalized Recommendation." Proposal.

[2] P. Resnick, H. R. Varian. (1997). "Recommender systems." Commun. ACM 40: 13.

[3] Melville, P., Sindhwani, V, "Recommender Systems." IBM T.J. Watson Research Center, Yorktown Heights, NY 10598: 21.

[4] Takacs.G, Pil´aszy.I, Nemeth.B, Tikk.D.(2009). "Scalable Collaborative Filtering Approaches for Large Recommender Systems." Journal of Machine Learning Research 10: 34.

[5] D. Goldberg, D. Nichols, B. M. Oki, and D. Terry.(1992). "Using collaborative filtering to weave an information tapestry". Communications of the ACM, 10.

[6] Hanani.U, Shapira.B, Shoval.P, (2001), "Information Filtering: Overview of Issues, Research and Systems". User Modeling and User-Adapted Interaction, 57.

[7] Shardanand.U, Maes.P. (1995). "Social Information Filtering: Algorithms for Automating "Word of Mouth". In CHI '95: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, New York, NY, USA. 8.

[8] Aha.W, Kibler.D, Albert.M. (1991). "Instance-Based Learning Algorithms". Machine Learning, 30.

[9] Sarwar.B, Karypis.G, Konstan.J, and Riedl.J. (2001). "Item-Based Collaborative Filtering Recommendation Algorithms". In WWW '01: Proceedings of the 10th International Conference on World Wide Web, New York, NY, USA.11.

[10] Karypis.G. (2001). "Evaluation of Item-Based Top-N Recommendation Algorithms". In CIKM '01: Proceedings of the Tenth International Conference on Information and Knowledge Management, New York, NY, USA. 8.

[11] Herlocker.J, Konstan.J, Al Borchers, and Riedl.J. (1999). "An Algorithmic Framework for Performing Collaborative Filtering". In SIGIR '99: Proceedings of the 22nd Annual International ACM SIGIR Conference on Research and Development in Information Retrieval, New York, NY, USA, 8.

[12] Breese. J. S, Heckerman. D, Kadie. C. (1998). "Empirical Analysis of Predictive Algorithms for Collaborative Filtering." Microsoft Research: 19.

[13] Chickering, D., Heckerman, D., and Meek, C. (1997). "A Bayesian approach to learning Bayesian networks with local structure".

[14] Burke, R. (2002). "Hybrid Recommender Systems: Survey and Experiments." User Modeling and User- Adapted Interaction: 40.

[15] Andrew I. Schein, A. P., Lyle H. Ungar, and David M. Pennock (2002). "Methods and Metrics for Cold-start Recommendations." In SIGIR '02: Proceedings of the 25th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval,New York: 8.

[16] Mark Claypool, A. G., Tim Miranda, Pavel Murnikov, Dmitry Netes, and Matthew Sartin. (1999). "Combining Content-Based and Collaborative Filters in an Online Newspaper." In Proceedings of ACM SIGIR Workshop on Recommender Systems.

[17] Burke, R. (1999). "Integrating Knowledge-Based and Collaborative-Filtering Recommender Systems." In Proceedings of the AAAI Workshop on AI in Electronic Commerce: 4.

[18] Lang, K. (1995). "NewsWeeder: Learning to Filter Netnews." In ICML '95: Proceedings of the 12th International Conference on Machine Learning,San Mateo, CA, USA,: 9.

[19] Roy, R. J. M. a. L. (2000). "Content-Based Book Recommending Using Learning for Text Categorization." In DL '00: Proceedings of the Fifth ACM Conference on Digital Libraries, New York, NY: 10.

[20] Rashid.A.M, Albert.I,Cosley.D, K.Lam.S., McNee.S, A. Konstan.J,and Riedl.J.(2002). "Getting to Know You: Learning New User Preferences in Recommender Systems." In IUI '02: Proceedings of the 7th International Conference on Intelligent User Interfaces,New York, NY: 8.

[21] Pazzani, M. (1999). "A framework for collaborative, content-based and demographic filtering." Artificial Intelligence Review 13: 16.

[22] Balabanovi´c, M, Shoham, Y. (1997). "Fab: Content-based, collaborative recommendation." Communications of the ACM 40: 7.

[23] McNee, S., Albert, I., Cosley, D., Gopalkrishnan, P., Lam, S., Rashid, A., Konstan, J., and Riedl, J. (2002). "On the recommending of citations for research papers". In Proceedings of the 2002 ACM Conference on Computer-Supported Cooperative Work. ACM Press, New Orleans, LA, USA, 10.

[24] Torres, R., McNee, S., Abel, M., Konstan, J., and Riedl, J. (2004). "Enhancing digital libraries with TechLens". In Proceedings of the 2004 Joint ACM/IEEE Conference on Digital Libraries. ACM Press, Tuscon, AZ, USA, 9.

[25] Smyth, B., & Cotter, P. (2001). Personalized electronic program guides for digital TV. Ai Magazine, 22(2), 89.

[25] Nichols, D. M. "Implicit Rating and Filtering." 6.

[26] Oard, D.W. and Marchionini, G. (1996), "A Conceptual Framework for Text Filtering", Technical Report CARTR-830, Human Computer Interaction Laboratory, University of Maryland at College Park.

Using Fast Fourier Extraction Method Power Quality Improvement by Dvr for Unbalanced Voltage Sag-Swell Control

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ABSTRACT:
Voltage sag and swell is big problem in power system. Sensitive load has a severe impact on itself due to voltage sag and swell. Dynamic Voltage Restorer (DVR) is a power customed device used in power distribution network. Matlab is an advanced simulation software used for effective modelling and simulation of DVR. Compensation for the control of voltage in DVR based on dq0 algorithm has been discussed here. To appropriately control the control targets for compensation voltage control, firstly the power circuit of a DVR systrm is analysed. The design is simple. The Simulation results are carried out by Matlab/Simulunk to verify the performance of the proposed method.

Keywords: *Power Quality, DVR, voltage sags/swells, VSI, Fast Fourier Extraction.*

I. INTRODUCTION

Power distribution systems, ideally, should provide their customers with an uninterrupted flow of energy at smooth sinusoidal voltage at the contracted magnitude level and frequency [1] however, in practice, power systems, especially the distribution systems, have numerous nonlinear loads, which significantly affect the quality of power supplies. As a result of the nonlinear loads, the purity of the waveform of supplies is lost. This ends up producing many power quality problems. Apart from nonlinear loads, some system events, both usual (e.g. capacitor switching, motor starting) and unusual (e.g. faults) could also inflict power quality problems[2].Power quality phenomenon or power quality disturbance can be defined as the deviation of the voltage and the current from its ideal waveform. Faults at either the transmission or distribution level may cause voltage sag or swell in the entire system or a large part of it. Also, under heavy load conditions, a significant voltage drop may occur in the system.Voltagesag and swell can cause sensitive equipment to fail, shutdown and create a large current unbalance. These effects can incur a lot of expensive from the customer and cause equipment damage [1]. The voltage dip magnitude is ranged from 10% to 90% of nominal voltage and with duration from half a cycle to 1 min and *swell* is defined as an increase in rms voltage or current at the power frequency for durations from 0.5 cycles to 1 min. Typical magnitudes are between 1.1 and 1.8 p.u[2].

There are many different methods to mitigate voltage sags and swells, but the use of a custom power device is considered to be the most efficient method, e.g. FACTS for transmission systems which improve the power transfer capabilities and stability margins. The term custom power pertains to the use of power electronics controller in a distribution system [10], especially, to deal with various power quality problems. Custom power assures customers to get pre-specified quality and reliability of supply. This pre-specified quality may contain a combination of specifications of the following: low phase unbalance, no power interruptions, low flicker at the load voltage, and low harmonic distortion in load voltage, magnitude and duration of over voltages and under voltages within specified limits, acceptance of fluctuations, and poor factor loads without significant effect on the terminal voltage.

There are different types of Custom Power devices used in electrical network to improve power quality problems. Each of the devices has its own benefits and limitations. A few of these reasons are as follows. The SVC pre-dates the DVR,butthe DVR is still preferred because the SVC has no ability to control active power flow [3]. Another reason include that the DVR has a higher energy capacity compared to the SMES and UPS devices. Furthermore, the DVR is smaller in size and cost is less compared to the DSTATCOM and other custom power devices. Based on these reasons, it is no surprise that the DVR is widely considered as an effective custom power device in mitigating voltage sags. In addition to voltage sags and swells compensation, DVR can also add other features such as harmonics and Power Factor correction. Compared to the other devices, the DVR is clearly considered to be one of the best economic solutions for its size and capabilities [4].

The voltage injection schemes and design of the DVR and the different control strategies for the controllers of the DVR have been discussed in [14-15]. E.g., the instantaneous reactive power theory (IRPT) [15], adaline based fundamental extraction have been implemented in [14]. Instantaneous symmetrical component theory, space vector modulation, synchronous reference frame theory (SRFT) based control techniques for a DVR are reported in this literature. The SRFT based algorithm reported in [15] involves conversion of three phase voltages from the stationary frame to rotating frame and vice versa. The IRPT algorithm has been used in [16] based on unit templates and instantaneous symmetrical component theory. In this paper, a new control algorithm is suggested based on SRF theory which includes P-I Controller for the generation of reference Vd and Vq. Reference load signal generation involves the conversion from three-phase to two-phase and vice versa. Moreover low pass filters are essential part of this algorithm which has slow dynamic response of the compensator.

The organization of the paper is as follows. In section II, the constructional part of the DVR is briefly described, the operating principle and the voltage injection capabilities of the DVR is discussed in section III, proposed control algorithm enumerated in section IV and the detailed description of MATLAB Simulation model along with its performance in electrical network discussed in section V and section VI respectively.

II. DYNAMIC VOLTAGE RESTORER(DVR)

DVR is a Custom Power Device used to eliminate supply side voltage disturbances. DVR also known as Static Series Compensator maintains the load voltage at a desired magnitude and phase by compensating the voltage sags/swells and voltage unbalances presented at the point of common coupling.

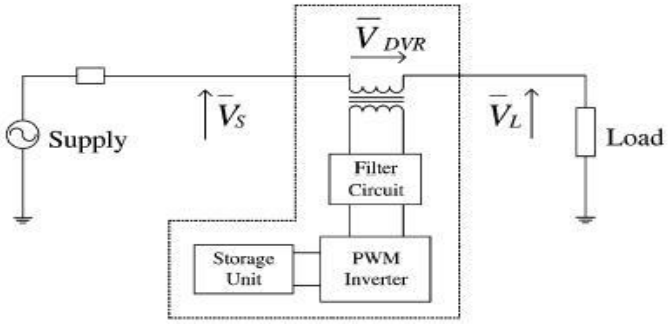


Figure-1: DVR series connected topology

The power circuit of the DVR is shown in Fig. 1.The DVR consists of 6 major parts:-

a) Voltage Source Inverter (VSI)

These inverters have low voltage ratings and high currentratings as step up transformers are used to boost up the injected voltage.

b) Injection Transformers

Three single phase injection transformers are connected indelta/open winding to the distribution line. These transformers can be also connected in star/open winding. The star/open winding allows injection of positive, negative and zero sequence voltages whereas delta/open winding only allows positive and negative sequence voltage injection.

c) Passive Filters

Passive filters are placed at the high voltage side of the DVR to filter the harmonics. These filters are placed at the high voltage side as placing the filters at the inverter side introduces phase angle shift which can disrupt the control algorithm.

d) Energy storage

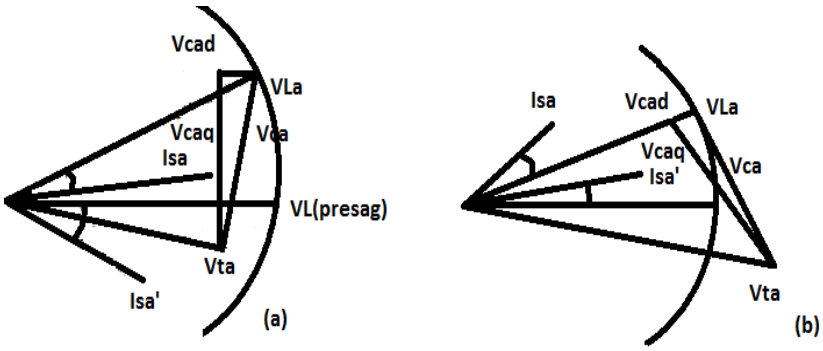
Batteries, flywheels or SMEs can be used to provide real power for compensation. Compensation using real power is essential when large voltage sag occurs.

e) Capacitor

DVR has alarge DC capacitor to ensure stiff DC voltage input to inverter.

f) By-Pass Switch

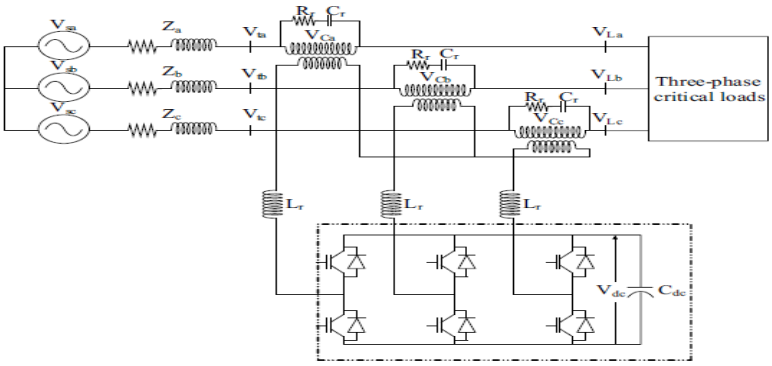
If the over current on the load side exceeds a permissible limit due to short circuit on the load or large inrush current, the DVR will be isolated from the system by using the bypass switches and supplying another path for current.



III. OPERAT ION OF DVR

The schematic diagram of a DVR is shown in Figure-2. Three phase source voltages (Vsa, Vsb, and Vsc) are connected to the 3-phase critical load through series impedance (Za, Zb, Zc) and an injection transformer in each phase. The terminal voltages (Vta, Vtb, Vtc) have power quality problems and the DVR injects compensating voltages (VCa, VCb, VCc) through an injection transformer to get undistorted and balanced load voltages (VLa, VLb, VLc). The DVR is implemented using a three leg voltage source inverter with IGBTs along with a dc capacitor (Cdc). A ripple filter (Lr, Cr) is used to filter the switching ripple in the injected voltage. The considered load, sensitive to power quality problems is a three-phase balanced lagging power factor load. A self-supported DVR does not need any active power during steady state because the voltage injected is in quadrature with the feeder current.

The DVR operation for the compensation of sag, swell in supply voltages is shown in Figure-3. Before sag the load voltages and currents are represented as VL (presag) and Isa' as shown in Figure-3(a). After the sag event, the terminal voltage (Vta) is gets lower in magnitude and lags the presag voltage by some angle. The DVR injects a compensating voltage (VCa) to maintain the load voltage (VL) at the rated magnitude. VCa has two components, VCad and VCaq. The voltage in-phase with the current (VCad) is required to regulate the dc bus voltage and also to meet the power loss in the VSI of DVR and an injection transformer [5]. The voltage in quadrature with the current (VCaq) is required to regulate the load voltage (VL) at constant magnitude. During swell event, the injected voltage (VCa) is such that the load voltage lies on the locus of the circle as shown in Figure-3(b).



IV. CONTROL OF DVR

The compensation for voltage sags using a DVR can be performed by injecting/absorbing reactive power or real power. When the injected voltage is in quadrature with the current at the fundamental frequency, compensation is achieved by injecting reactive power and the DVR is self-supported with dc bus. But, if the injected voltage is in phase with the current, DVR injects real power and hence a battery is required at the dc side of VSI. The control technique adopted should consider the limitations such as the voltage injection capability (inverter and transformer rating) and optimization of the size of energy storage.

Figure-4 shows the control block of the DVR in which the synchronous reference frame (SRF) theory is used for the control of self-supported DVR. The voltages at PCC (Vt) are converted to the rotating reference frame using the abc-dqo conversion. The harmonics and the oscillatory components of voltages are eliminated using low pass filters (LPF). The components of voltages in d-axis and q-axis are,

$$Vsd = Vsd\ dc + Vsd\ ac$$
$$Vsq = Vsq\ dc + Vsq\ ac$$

The compensating strategy for compensation of voltage quality problems considers that the load terminal voltage should be of rated magnitude and undistorted.

The dqo transformation or Park's transformation [6] is used to control of DVR. The dqo method gives the sag depth and phase shift information with start and end times. The quantities are expressed as the instantaneous space vectors. Firstly convert the voltage from a-b-c referenceframe to d-q-o reference. For simplicity zero phase sequence components is ignored.

Illustrates a flow chart of the feed forward dqo transformation for voltage sags/swells detection. The detection is carried out in each of the three phases. The control is based on the comparison of a voltage reference and the measured terminal voltage (Va, Vb, Vc).The voltage sags is detected when the supply drops below 90% of the reference value whereas voltage swells is detected when supply voltage increases up to 25% of the reference value. The error signal is used as a modulation signal that allows generating a commutation pattern for the power switches (IGBT's) constituting the voltage source converter. The commutation pattern is generated by means of the sinusoidal pulse width modulation technique (SPWM); voltages are controlled through the modulation.

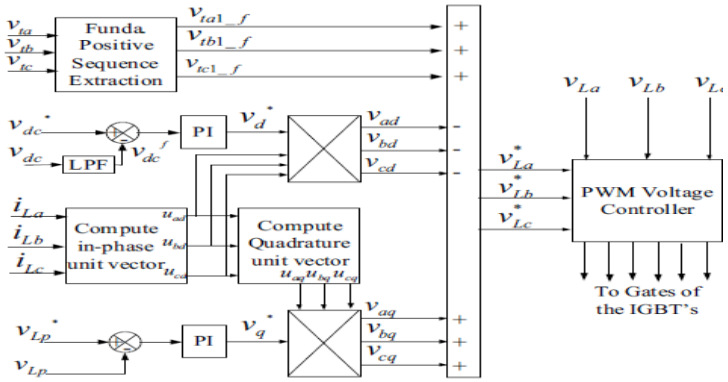


Figure-4: Proposed control strategy for the DVR

The speed of the response is determined by parameters K, Kp and Kv. Theseparameters control transient as well as steady state behaviour of the filter. There exists a compromise between speed and accuracy. For large K and KpKv , the convergence of the estimated values to actual values is faster but the steady state misadjustment is higher. This is an inherent characteristic of an adaptive algorithm. Parameters and ought to be selected appropriately according to the application. Increasing the value of K increases the speed. However, it creates oscillations in the peak detection response. There is a trade-off between speed and accuracy (or smoothness). Decreasing K and KpKv yields an estimation of the peak which is insensitive / robust to the undesirable variations and noise in the input signal. The presented PLL provides the following advantages online estimation of the amplitude, phase and their corresponding time derivatives of the pre-selected component of the input signal are provided.

V. MATLAB MODELLING AND SIMULATION

The DVR is modelled and simulated using the MATLAB and its Simulink and Sim Power System toolboxes. The MATLAB model of the DVR connected system is shown in fig. below. The three-phase programmable source is connected to thethree-phase load through the DVR in order to generate sag, swell and harmonics in supply side. The considered load is a lagging power factor load. The VSI of the DVR is connected to the system using an injection transformer. In addition, a ripple filter for filtering the switching ripple in the terminal voltage is connected across the terminals of the secondary of the transformer. The dc bus capacitor of DVR is selected based on the transient energy requirement and the dc bus voltage is selected based on the injection voltage level. The dc capacitor decides the ripple content in the dc voltage.The system data are given in Appendix.

The control algorithm for the DVR is simulated in MATLAB. The control algorithm shown in Fig.-4 is modelled for DVR control of Fig.-5. The reference load voltages are derived from the sensed terminal voltages, load supply voltages and the dc bus voltage of the DVR. A pulse width modulation (PWM) controller is used over the reference and sensed load voltages to generate gate signals for the IGBT's of the VSI.

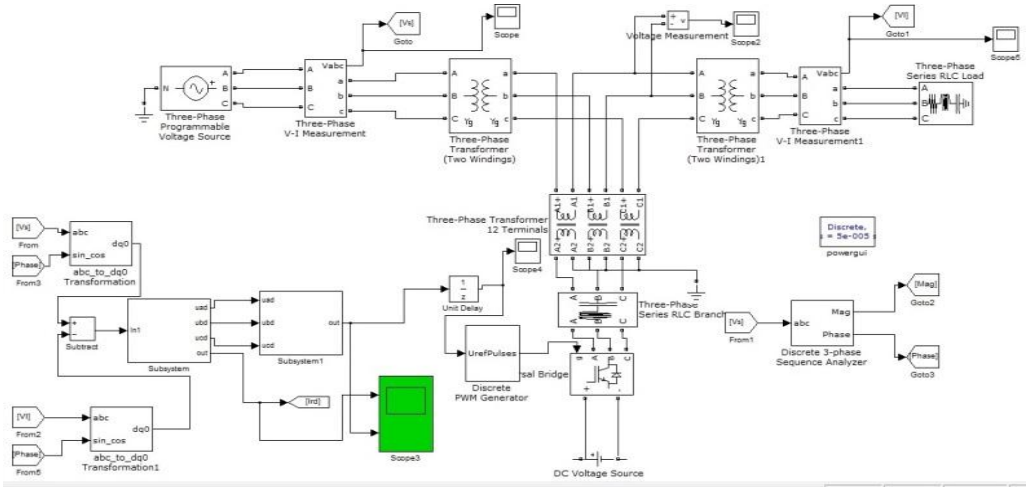


Figure 5.Matlab model of the DVR connected system

VI. PERFORMANCE OF THE DVR SYSTEM

The performance of the DVR is demonstrated for different supply voltage disturbances such as sag and swells in supply voltage [3].A case of Three-phase voltage sag is simulated and the results are shown in Figure-6. A case of Three-phase voltage swell is simulated and the results are shown in Figure-7(a),(b) and (c) show the voltage injected by the DVR and the compensated load voltage, respectively. As a result of DVR, the load voltage is kept at 1 p.u. throughout the simulation, including the voltagesag period. It is observed that during normal operation, the DVR is not operational. It quickly injects necessary voltage components to smoothen the load voltage upon detecting voltage sag.

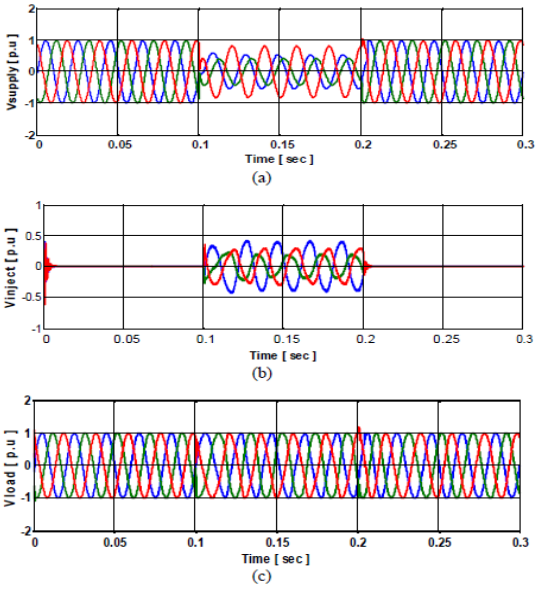


Fig.-Unbalanced voltage sag (a) Source voltage (b) Injected voltage (c) Load voltage

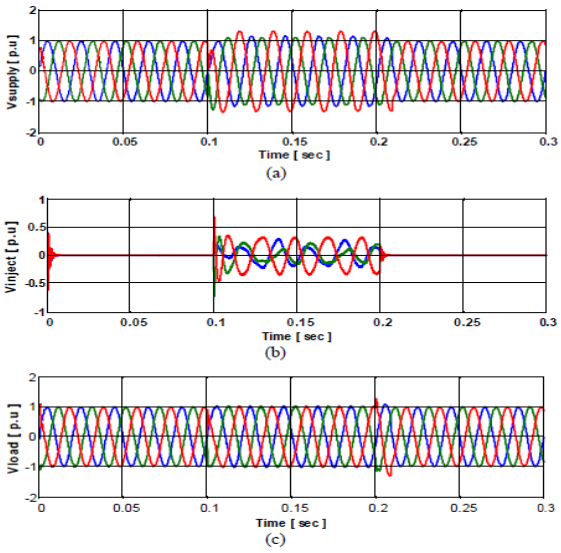


Fig.-Unbalanced voltage swell (a) Source voltage (b) Injected voltage (c) Load voltage

Figure-8(a) shows the first simulation was done with no DVR and a three phase fault is applied to the system at point with fault resistance of 0.66 U for a time duration of 200 ms. Figure-8(b) shows The second simulation is carried out at the same scenario as above but a DVR is now introduced at the load side to compensate the voltage sag occurred due to the three phase fault applied.

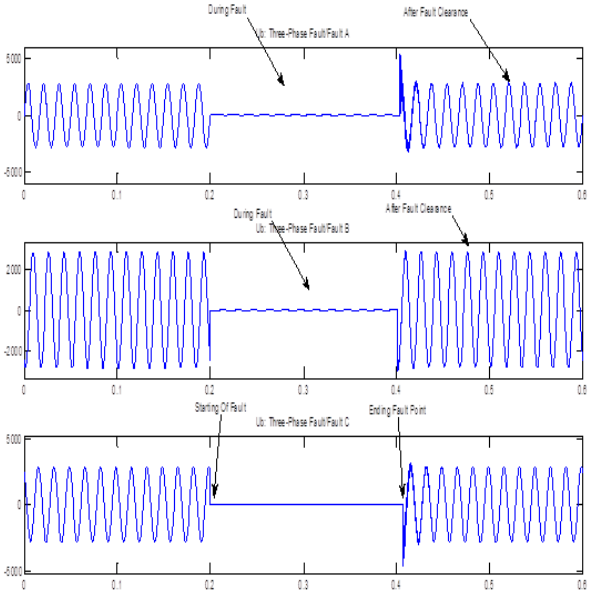


Fig.-8(a) Three phase fault without DVR

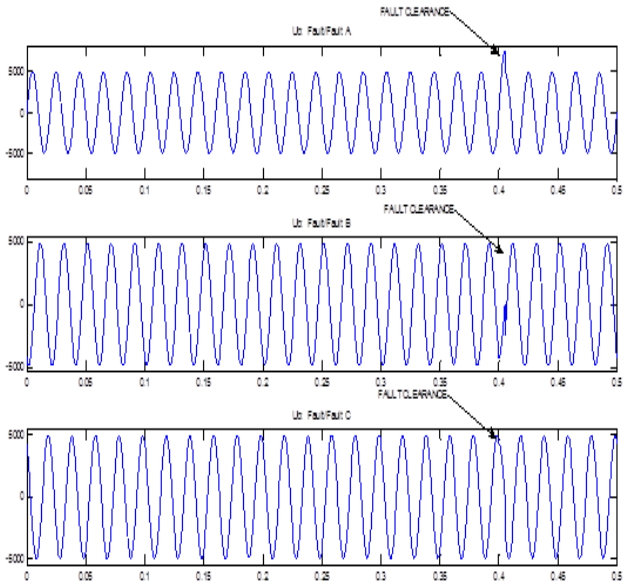


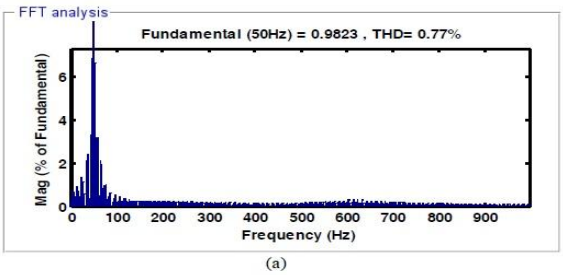
Fig.-8 Three phase fault with DVR voltage compensation

The harmonic compensation in load voltage achieved and depicted in Figure-9(a) and (b). The terminal voltage is distorted by adding 5th harmonic inversely proportional to their harmonic number. The load voltage is sinusoidal and constant in magnitude due to the injection of opposite harmonic voltage by DVR.

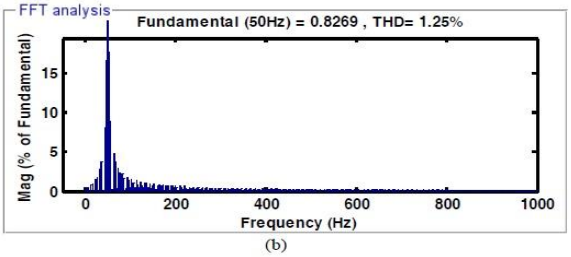
VII. CONCLUSION

The DVR modeling and simulation has been shown bythe aid of Matlab/Simulink. The control system is based on dq0 technique which is a scaled error, between source side of the DVR and its reference for compensating sags and swells. The simulation shows that the DVR performance is efficient in mitigation of voltage sags and swells.

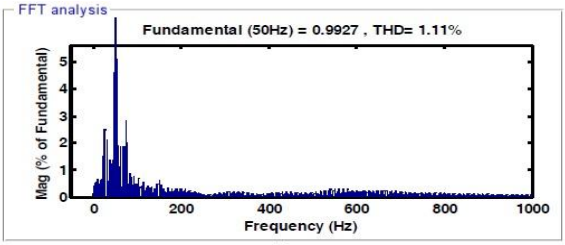
According to the simulation results, the DVR is able to compensate the sags and swells during single line to ground (SLG) fault and three-phase fault. As result of the FFT analysis, the compensated load voltage by the DVR has appropriate *THD*. The DVR handles both balanced and unbalanced situations without any difficulties. It injects an appropriate voltage component to correct any anomaly rapidly in the supply voltage; in addition, it keeps the load voltage balanced and constant at the nominal value.



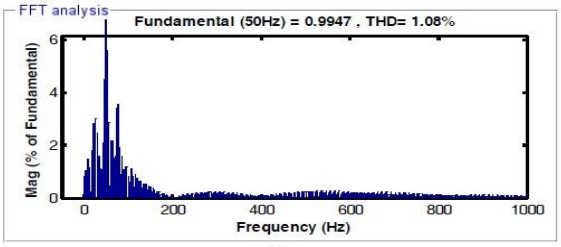
(a)



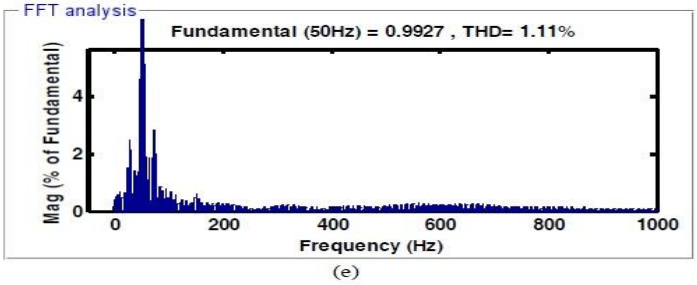
(b)



(c)



(d)



(e)

THD of compensated load voltage (a), three-voltage sag (b), Single-phase voltage sag (c), unbalanced voltage sag (d), three-phase Voltage swell (e) unbalanced voltage swell

REFERENCES

[1] Power Quality Problems and New Solutions by A. de Almeida, L. Moreira. J. Delgado
[2] Math H.J. Bollen, Understanding power quality problems: voltage sags and interruptions, IEEE Press, New York, 2000
[3] Performance of DVR under different voltage sag and swell conditions by T. Devaraju, V. C. Reddy and M. Vijaya Kumar
[4] Voltage Quality Improvement Using DVR by Chellali BENACHAIBA, Brahim FERDI
[5] Adaline-Based Control of Capacitor Supported DVR for Distribution System Bhim Singh*, P. Jayaprakash†, and D. P. Kothari
[6] Control of three level inverter based DVR by 1S.LEELA, S.DASH
[7] Rating and Design Issues of DVR Injection Transformer by Sasitharan S., Mahesh K. Mishra, *Member, IEEE*, B. Kalyan Kumar, and JayashankarV.,*member, IEEE*
[8] Particle Swarm Optimization based Dynamic Voltage Restorer
[9] Power Quality Enhancement Using Custom Power Devices by A. Ghosh and G. Ledwich. 2002. Kluwer Academic Publishers.
[10] FACTS controllers in power transmission and distribution by K. R. Padiyar

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Using Genetic Algorithm Minimizing Length of Air-Gap and Losses along with Maximizing Efficiency for Optimization of Three Phase Induction Motor

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ABSTRACT:

Optimization of three-phase induction motor using Genetic Algorithm (GA) is displayed in the paper. Objective functions such as Air-Gap Length (Lg), SCL, RCL, SIL and efficiency are considered here along with their individual plotting after optimization have been presented. The intense non-linearity of the motor stated here have been observed in mathematical form and hence forth solved using MATLAB. To optimize performance of the Induction Motor the Genetic Algorithm method has been very useful for this purpose. MATLAB is very powerful software which has been used here effectively.

Keywords: *Air-Gap Length, Efficiency, GA, Induction Motor, RCL, SCL, SIL.*

I. INTRODUCTION

Induction motors have a wide range of applications in domestic and industrial purposes. Squirrel Cage Induction motor is the most widely used in industrial sector due to its low cost, simplicity and robustness. Most of the electrical energy is consumed by this motor, so a major concern becomes the minimization of the electrical energy used.

As per our literature survey several methods on multi-objective approaches for optimization have been uncounted. In this paper a 3-phase, 4 pole, 2238W Induction Motor has been optimized by GA and the results have been compared with the standard design results

The organization of the paper is as follows. In section II, the problem has been defined along with its design approach. The objective functions have been described in section III. In section IV a brief description of genetic algorithm has been given with its flow chart in section V. the section VI concludes with the results and discussion.

The performance of the machine is affected due to its non-linearity of the variables. The standard Non-linear programming (NLP) process becomes very inefficient and also expensive. One of the most evolved NLP technique is the Genetic Algorithm(GA) which has become important for design optimization of electrical machines. GA helps in finding the Global minimum in place of the local minimum, which may have different starting points and may not be near to the actual values. The aim of this paper is to ensure the optimum design of a three-phase Induction Motor considering the Air-Gap Length (Lg), and the stator winding temperature. The reduction in air-gap length and losses improves the efficiency of the machine as well as its power factor. The machine taken into consideration here is a 3-phase, 4pole, 2238 watt Squirrel Cage Induction Motor.[1]

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II. PROBLEM DEFINITION AND DESIGN APPROACHES.

Figure 1.presents the basic equivalent circuit model of the motor. This model is well known and easily understood by the engineers and has both less computational effort and good prediction accuracy. This figure shows the per phase representation of the balanced poly-phase induction machine in the frequency domain, having six elements or parameters. The parameters are as follows, Stator Resistance (R_1), Stator leakage reactance $(X\sigma_1)$,core-loss resistance (R_m), rotor leakage reactance $(X\sigma_2)$, magnetizing reactance $(X\sigma_m)$ and rotor resistance (R_2). The approach and methods used to calculate the motor performance are based on the works of [2].

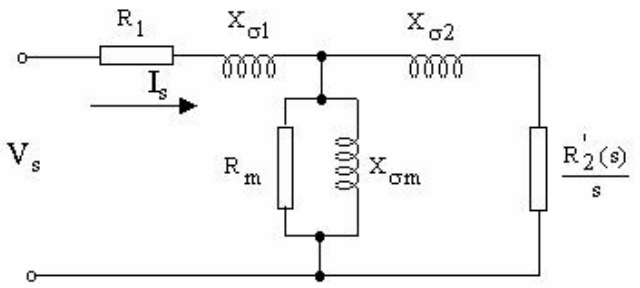

Figure 1: Equivalent circuit model of induction motor

For applying the NLP technique (GA), firstly an objective function has to be defined to evaluate how good each motor design is. A large subset of design variables are needed to be formulated to ensure physical feasibility of the motor, are included in the objective function.

III. THE OBJECTIVE FUNCTIONS FOR OPTIMIZATION USING GA.

A lot of attention is required for the design optimization of electric motors regarding the choice of objective functions that usually deals with the performance and economic features.

The four objective functions considered here for the design optimization process of the three phase Induction Motor are as follows:[9,11,12]

a). Length of Air-Gap (to minimize),
b). Stator Copper Loss (to minimize).
c) Rotor Copper Loss(to minimize)
d)Stator Iron Loss(to minimize)
e)Efficiency(to maximize)
Consideration for the multi-objective approach and its formulations are as follows:

a) ***First Objective Function***: to minimize Air-Gap length.

$$Lg = 2\sqrt{\frac{D_1 L_1}{10^6}}$$

Where,D1= Bore Diameter in mm and L1= Stack Length in m.

b) ***Second Objective Function***: to minimize Stator Copper Loss.

$$SCL = 3 \times I_1^2 \times R_1$$

Where, I1= Phase current in ampere,
and R1= Stator resistance in ohms.

c) ***Third Objective Function***: to minimize Rotor Copper Loss.

$$RCL = \frac{\rho_2 \times S_r \times I_2^2}{A_b}(L_c + \frac{2D_{me}}{P})$$

Where, ρ_2 =0.021(constant),
Sr = Number of Rotor Slots
I2=Rotor bar current in ampere(A),
Ab= Area of the bar,
Lc= Core Length in meter(m),
Dme= Mean end ring diameter in mm,

P= Number of Poles.

d) ***Fourth Objective Function***: to minimize Stator Iron Loss.

$$SIL = (W_{ts} \times W_{tkg}) + (W_{cs} \times W_{ckg})$$

Where, Wts = Stator Teeth weight,
Wtkg = Losses in stator tooth W/kg,
Wcs = Stator Core weight,
Wckg = Losses in Stator core W/kg.

e) ***Fifth Objective Function*** : to maximize efficiency

$$\eta = \frac{1000 \times P_{out}}{1000 \times P_{out} + (SCL + RCL + SIL + WF)} \times 100$$

Where, Pout= output power in watt
WF= windage and friction loss is 1% of output

The motor design variables here are :

1) Ampere Conductors(q)----------x(1)
2) Average air-gap flux density(Bav)--- -------x(2)
3) Bore Diameter(D)----------x(3)
4) Efficiency(η)----------x(4)
5) Power Factor(p.f.)----------x(5)
6) Stator winding current density(δ_1)---------x(6)
7) Stack length to pole pitch ratio (L/τ)------x(7)
8) Rotor winding current density(δ_2)---------x(8)
9) Ratio of slot height to slot width (Hs/Ws)--x(9)
10) Outer Diameter (D0)----------x(10)
11) Height of core(Hc) ----------x(11)
12) Maximum flux density in tooth(Btmax)--- x(12)
13) Maximum flux density in core(Bcmax)---- x(13)

IV. GENETIC ALGORITHM OVERVIEW

Selection

Selection is the process of choosing two parents from the population for crossing. After deciding on an encoding, the next step is to decide how to perform selection. According to Darwin's theory of evolution the best ones survive to create new offspring. Selection is a method that randomly picks chromosomes out of the population according to their evaluation function. The higher the fitness function, the more chance an individual has to be selected. Some of the selection methods are :

Crossover (Recombination)

Crossover is the process of taking two parent solutions and producing from them a child. After the selection (reproduction) process, the population is enriched with better individuals. Reproduction makes clones of good strings but does not create new ones.
Crossover operator is applied to the mating pool with the hope that it creates a better offspring.

Mutation

After crossover, the strings are subjected to mutation. Mutation is performed to one individual to produce a new version of it where some of the original genetic material has been randomly changed. Mutation prevents the algorithm to be trapped in a local minimum. Mutation plays the role of recovering the lost genetic materials as well as for randomly disturbing genetic information. It is an insurance policy against the irreversible loss of genetic material. Mutation has traditionally considered as a simple search operator. If crossover is supposed to exploit the current solution to find better ones, mutation is supposed to help for the exploration of the whole search space. Mutation is viewed as a background operator to maintain genetic diversity in the population. It introduces new genetic structures in the population by randomly modifying some of its building blocks. Mutation helps escape from local minima's trap and maintains diversity in the population.

Fitness Scaling

Fitness scaling is performed in order to avoid premature convergence and slow finishing. The various types of fitness scaling are: Linear scaling, σ-Truncation and Power law.

A genetic algorithm is a problem solving method that uses genetics as its model of problem solving. It's a search technique to find approximate solutions to optimization and search problems. GA handles a population of possible solutions. Each solution is represented through a chromosome, which is just an abstract representation. For GAs to find a best optimum solution, it is necessary to perform certain operations over these individuals. The process starts by generating an initial population of chromosomes. [10]

This first population must offer a wide diversity of genetic materials. The gene pool should be as large as possible so that any solution of the search space can be engendered. Then, the GA loops over an iteration process to make the population evolve. Each iteration consists of selection, reproduction, evaluation and replacement.

In the most general sense, GA-based optimization is a stochastic search method that involves the random generation of potential design solutions and then systematically

evaluates and refines the solutions until a stopping criterion is met. There are three fundamental operators involved in thesearch process of a genetic algorithm: selection, crossover, and mutation. The genetic algorithm implementation steps are shown as follows:

The genetic algorithm implementation steps are shown as follows:
Step 1: Define parameter and objective function (Initializing)
Step 2: Generate first population at random
Step 3: Evaluate population by objective function
Step 4: Test convergence. If satisfied stop, else continue.
Step 5: Start reproduction process (Selection, Crossover, and Mutation)
Step 6: New generation. To continue the optimization, return to step 3.

V. DESIGN OPTIMIZATION BY GA

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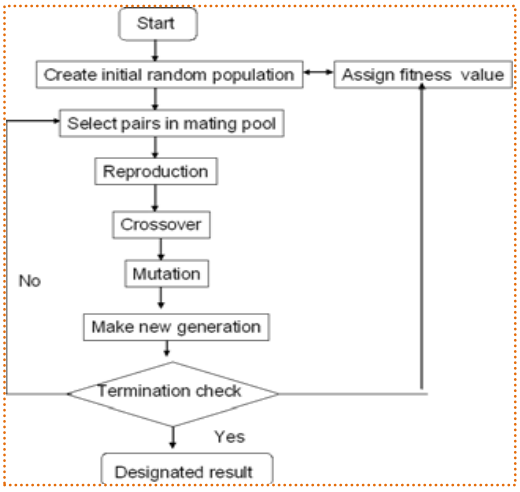

Figure 2: Flow Chart for Design Optimization

Here, the figure 2. Shows the design optimization procedure flowchart. The blocks contain a number of sub-routines. The program execution namely the initial motor design variables, number of generations, population size, crossover-rate, mutation rate and fitness scaling. The user dependent factors are the population size, number of generations, crossover-rate and mutation rate.

The penalty function consisting of each design variable and penalty limits, which can be varied within its domain. The design variables of both stator and rotor is calculated. This in turn is followed by optimization process such as selection, crossover, mutation and specification of the lower and upper bounds.

The design is evaluated for every individual of a population. After the optimum design is reached the algorithm ends after testing the specified convergence. Now the performance analysis for the proposed design

can be viewed. If optimization are satisfied, then the design optimization process must be stopped, else continue the GA process of optimization.

VI. RESULTS AND DISCUSSION

Comparison of performance of GA based design with normal design, shows that normal design has high air-gap length, losses and low efficiency. This is because in normal design procedure the design parameters are selected manually whereas, in GA method the design parameters are automatically varied to find the optimal solution. So, the optimally designed motor has lower air-gap length and losses are reduced which in turn improves power factor a great extent. Hence there is significant increase in the efficiency due to the reduction in losses. The Table 1.Shows the comparison of the normal design procedure with the proposed method.

Table 1. Proposed Design results compared with conventional design results.

Serial No:	Description	Conventional Design	Proposed Design
1)	Ampere Conductor	24,000	23,778
2)	Average air gap flux density(wb/m^2)	0.737	0.439
3)	Bore Diameter (D) in mm	0.075	0.105
4)	Efficiency(η)	83.906	94.0904
5)	Power Factor(p.f)	0.824	0.96777
6)	Stator winding current density (A/mm^2)	4	4.002
7)	Ratio of stack length to pole pitch	1.894	1.967
8)	Rotor winding current density (A/mm^2)	4	4.002
9)	Ratio of slot height to slot width	3.001	3.0039
10)	Outer Diameter in mm	0.112	0.119
11)	Core Height (Hc)	2.001	2.007
12)	Maximum flux density in tooth (Btmax)	1.301	1.601
13)	Maximum flux density in core (Bcmax)	1.200	1.292

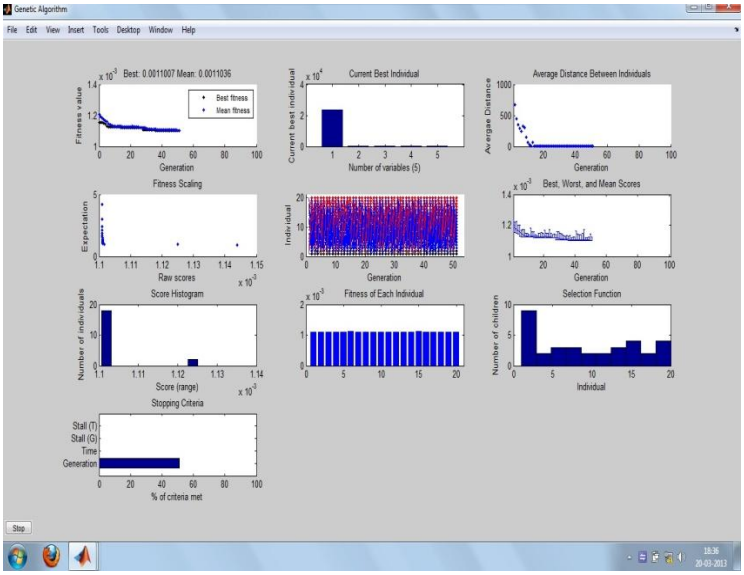

Figure 3: Air-Gap Length Optimization By GA

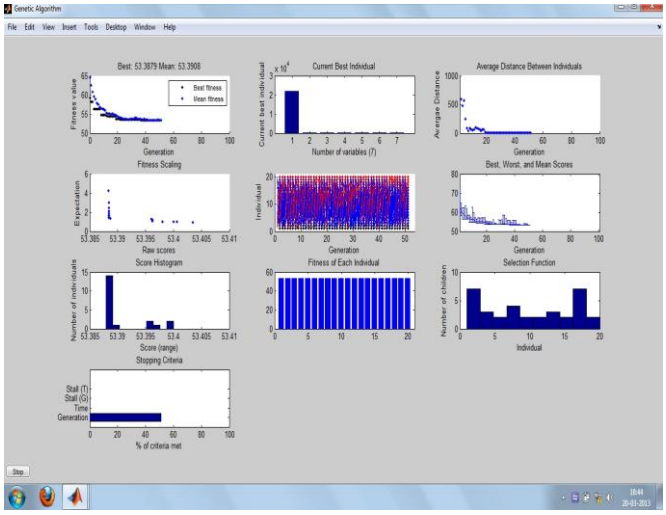

Figure 4: Stator Copper Loss

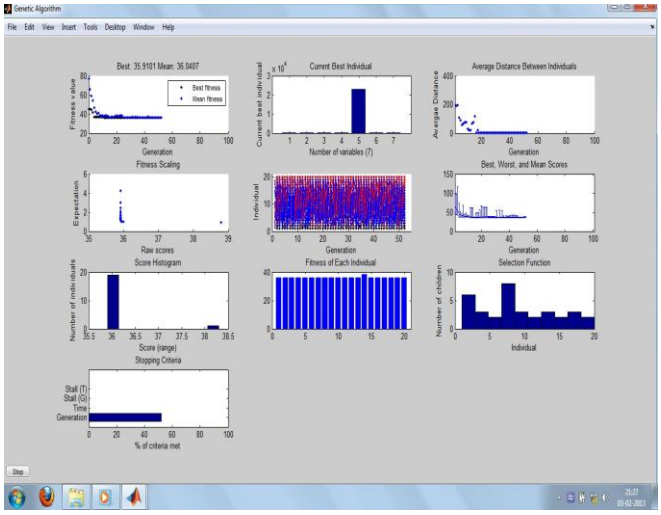

Figure 5: Rotor Copper Loss

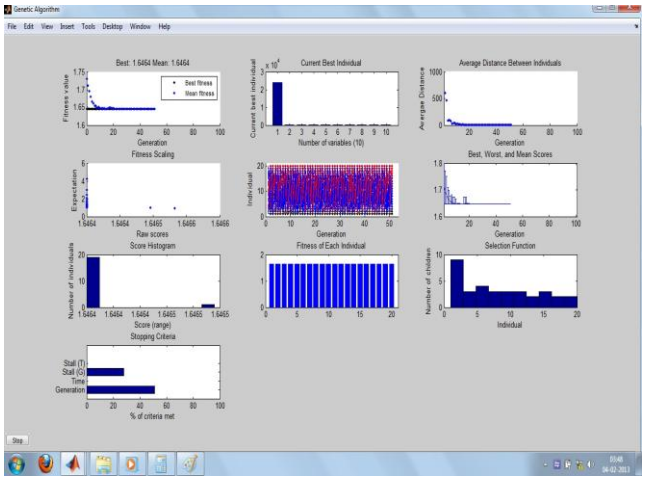

Figure 6: Stator Iron Loss

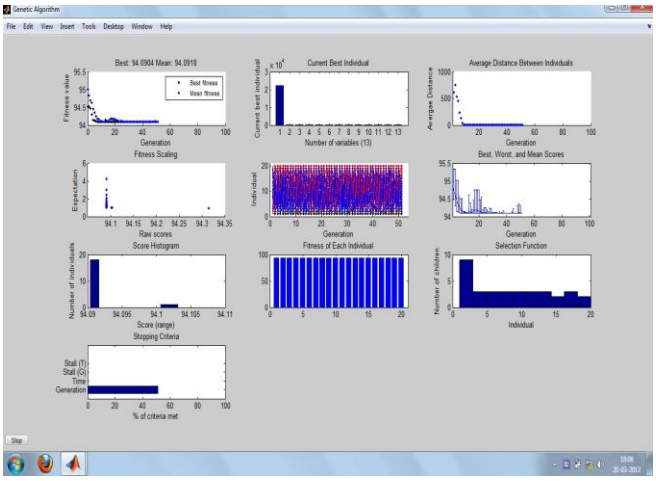

Figure 7: Efficiency

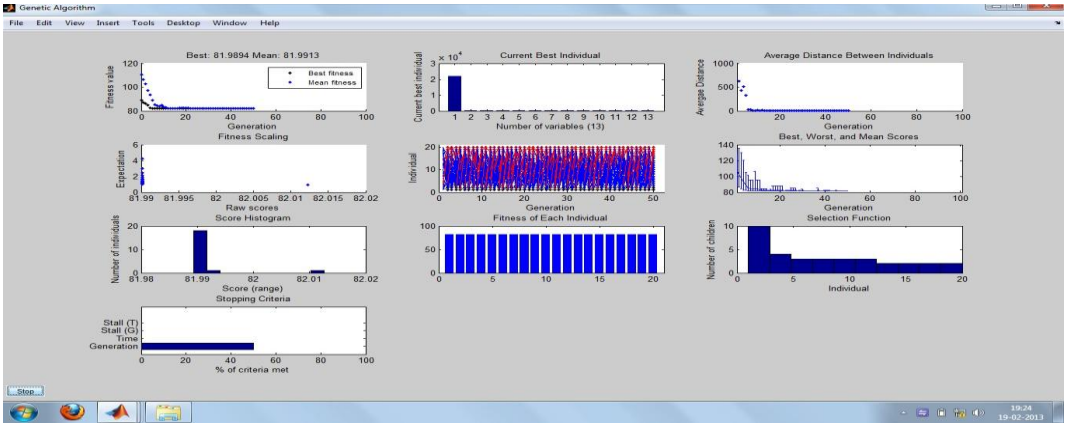

Figure 8: Total Optimization Graph

VII. CONCLUSION

A unique NLP technique known as GA was applied to the design process for optimization to occur. The results above shows the output performance of the motor optimized by GA process proves to be far better than the conventional procedure. The normal design has been compared with the proposed design of 3-phase squirrel cage Induction Motor both having the same ratings. Matlab is powerful design and simulation software which has been used here.

REFERENCES

[1]. Mehmet Çunkasa, and RamazanAkkaya, "Design Optimization of InductionMotor by Genetic Algorithm and Comparison with Existing Motor" Mathematicaland Computational Applications, Vol. 11, No. 3, pp. 193-203, 2006.

[2]. S.S.Sivaraju and N.Devarajan, "Novel Design of Three Phase Induction MotorEnhancing Efficiency, Maximizing Power Factor and Minimizing Losses"European Journal of Scientific Research ISSN 1450-216X Vol.58 No.3 (2011), pp.423-432 © EuroJournals Publishing, Inc. 2011.

[3]. R Fci, E.F. Fuchs,and H. Huaugh, "Comparison of two optimization techniquesfor the design of a three-phase induction motor design", IEEE Trans on Energy Conv.;4(4):651-9, 1989.

[4]. Fernando J. T. E. Ferreira, Member, IEEE, and An´ıbal T. de Almeida, SeniorMember, IEEE "Novel Multiflux Level, Three-Phase, Squirrel-Cage InductionMotor for Efficiency and Power Factor Maximization" IEEE Transactions on Energy Conversion, Vol. 23, NO.1, March 2008.

[5]. J. Faiz, and M.B.B. Sharifian, "Optimal design of three phase induction motorsand their comparison with a typical industrial motor." Int. J. of Comp. and Elect.Eng. 27:133-144, 2001.

[6]. J. Appelbaum, E. F. Fuchs and J. C. White, "Optimization of Three-phaseInduction Motor Design, Part I: Formulation of the Optimization Technique", IEEETrans. on Energy Conversion, Vol. EC- 2, No. 3, September 1987, pp. 407-414.

[7]. J. Appelbaum, I. A. Khan, E. F. Fuchs and J. C. White,"Optimization of ThreephaseInduction Motor Design, Part 2: The Efficiency and Cost of an OptimalDesign ", IEEE Trans. on Energy Conversion, Vol. EC- 2, No. 3,September1987,pp. 415-422.

[8]. N. Bianchi, S. Bolognani, "Design optimization of electric motors by geneticalgorithm". IEE Proc. Electr. Power Appl., 145: 475-483, 1998.

[9]. Computer-Aided Design of Electrical Machines by K.M.Vishnu Murthy.

[10]. Engineering Optimization Theory and Practice by SingiresuS.Rao.

[11]. Electrical Machine Design by A.K.Sawhney.

[12]. Minimizing Air Gap Length and Losses for Optimal Design Of Three Phase Induction Motor by Genetic Algorithm by Surojit Sarkar, Satyajit Samaddar, Dr.P.K.Saha, Dr.G.K.Panda in International Journal Of Engineering And Computer Science ISSN:2319-7242 Volume 2 Issue 2 Feb 2013 Page No. 293-298.

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Literature review: Iris Segmentation Approaches for Iris Recognition Systems

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ABSTRACT:

A biometric system offers automatic identification of a human being based on the unique feature or characteristic which is being possessed by the individual. The iris segmentation has its own major applications in the field of surveillance, forensics as well as in security purposes. The performance of the iris recognition systems depends heavily on segmentation and normalization techniques. A review of various segmentation approaches used in iris recognition is done in this paper. The survey is represented in tabular form for quick reference.

Index Terms*—iris recognition, biometrics, iris segmentation, integrodifferential operator, near infrared light, fuzzy k-means clustering algorithm, Gabor filter*

I. INTRODUCTION

In the recent years, drastic improvements have been accomplished in the areas like iris recognition, automated iris segmentation, edge detection, boundary detection etc. Iris recognition is a biometric recognition technology that utilizes the pattern recognition techniques based on the high quality images of iris. An iris recognition system mainly uses infrared or else the visible light. The systems which are based on near infrared light (NIR) are very common because NIR will not generate reflections that makes iris recognition complex. But, NIR images lacks pigment coloration information, thus recognition algorithms must entirely depend on the patterns that are unrelated to color. Iris recognition which is based on visible light raise up pigmentation, thus the recognition systems will be able to exploit the color patterns, which make identification much easier. This is because; the pigmentation patterns contain lots of information that can be utilized for recognition. But the visible light reflections in these types of systems can result in a extensive amount of noise in the gathered images. Typical iris recognition system consists of mainly three modules. They are image acquisition, pre-processing stage as well as feature extraction and encoding. Image acquisition is a module which involves the capturing of iris images with the help of sensors. Pre-processing module provides the determination of the boundary of iris within the eye image, and then extracts the iris portion from the image in order to facilitate its processing. It involves the stages like iris segmentation, iris normalization, image enhancement etc. The performance of the system has been analyzed in the feature extraction and encoding stage. All these stages involve their own developments. Edge detection systems like boundary as well as the edge detection have been provided with much advancement. Also, major improvements have been made in the field of iris segmentation, which is very much important in the area of iris recognition.. In this paper, some of the methods involving iris segmentation have been analyzed.

Approaches like Integrodifferential operator [1], Hough transform [2] constitute a major part in the iris recognition techniques. Many other iris recognition as well as the iris segmentation approaches [3,4,5,6,7,8] has been introduced. Each one has its own advantage as well as the disadvantage. Major drawbacks involved in all the papers is that, the segmentation accuracy has not been achieved yet. Thus, there is a strong need to develop a new segmentation approach that is more reliable as well as robust, which can automatically segment non ideal iris images, which has been acquired using visible illumination in very less constrained imaging environments. Thus, here a unified framework approach [9] has been introduced, which automatically provide the localized eye images from face images for iris recognition. And also, an efficient post processing operations has been introduced in order to mitigate the noisy pixels which have been formed by the misclassification. In this, a work has been done at pixel level by exploiting the localized Zernike moments (ZM) at different radii in order to categorize each pixel into iris as well as non-iris regions. This paper focuses mainly on the accurate segmentation of iris region, which is very much important in iris recognition process.

II. APPROACHES USED FOR IRIS RECOGNITION

A. Integrodifferential operator

This approach [1] is regarded as one of the most cited approach in the survey of iris recognition. Daugman uses an integrodifferential operator for segmenting the iris. It find both inner and the outer boundaries of the iris region. The outer as well as the inner boundaries are referred to as limbic and pupil boundaries. The parameters such as the center and radius of the circular boundaries are being searched in the three dimensional parametric space in order to maximize the evaluation functions involved in the the model. This algorithm achieves high performance in iris recognition. It is having a drawback that, it suffers from heavy computation.

B. Hough Transform

In this paper, in order to perform personal identification and also the verification, an automated iris recognition system has been examined as the biometrically based technology. This paper also defines the technical issues which are being produced while designing an iris recognition system. The technical issues involve three parts viz. while image acquisition, iris localization and also matching of the extracted iris pattern. The major challenges involved in the image acquisition are in terms of image resolution and also in the focus using some standard optics. Here, an extant system has been used in order to provide a remedy to these challenges. Next issue is the iris localization. That is the image capture during the image acquisition will be a very larger image which contains iris as a part of it. Thus localization of the part that corresponds to the iris from acquired image is very much important. The edge detection has been performed through the gradient-based Canny edge detector, which is followed by the circular Hough transform [2], which is used for iris localization. The final issue is the pattern matching. After the localization of the region of the acquired image which corresponds to the iris, the final operation is to decide whether pattern matches with the previously saved iris pattern. This stage involves alignment, representation, goodness of match and also the decision. All these pattern matching approaches relies mainly on the method which are closely coupled to the recorded image intensities. If there occurs a greater variation in any one of the iris, one way to deal with this is the extraction as well as matching the sets of features that are estimated to be more vigorous to both photometric as well as geometric distortions in the obtained images. The advantage of this method is that it provides segmentation accuracy up to an extent. The drawback of this approach is that, it does not provide any attention to eyelid localization (EL), reflections, eyelashes, and shadows which is more important in the iris segmentation.

C. Masek Method

Masek introduced an open iris recognition system [3] for the verification of human iris uniqueness and also its performance as the biometrics. The iris recognition system consists of an automated segmentation system, which localise the iris region from an eye image and also isolate the eyelid, eyelash as well as the reflection regions. This Automatic segmentation was achieved through the utilization of the circular Hough transform in order to localise the iris as well as the pupil regions, and the linear Hough transform has been used for localising the eyelid occlusion. Thresholding has been employed for isolating the eyelashes as well as the reflections. Now, the segmented iris region has got normalized in order to eliminate the dimensional inconsistencies between the iris regions. This was achieved by applying a version of Daugman's rubber sheet model, in which the iris is modeled as a flexible rubber sheet, which is unpacked into a rectangular block with constant polar dimensions. Ultimately, the iris features were encoded by convolving the normalized iris region with the 1D Log-Gabor filters and phase quantizing the output to produce a bit-wise biometric template. For metric matching, the Hamming distance has been chosen, which provides a measure of number of disagreed bits between two templates. The drawback of [2] has been recovered in this paper i.e., the localisation of the circular iris as well as the pupil region, occlusion of eyelids as well as the eyelashes, and also the reflection occurs. The drawback of this approach is that the iris segmentation is not that much accurate and also the speed of the system is low.

D. Fuzzy clustering algorithm

A new iris segmentation approach, which has a robust performance in the attendance of heterogeneous as well as noisy images, has been developed in this. The process starts with the image-feature extraction where three discrete i.e., (x, y) which corresponds to the pixel position, and z which corresponds to its intensity values has got extracted for each and every image pixel, which is followed by the application of a clustering algorithm which is the fuzzy K-means algorithm[4]. This has been used inorder to classify each and every pixel and then generate the intermediate image. This correspondent image is then used by the edge-detector algorithm. As it has additional homogeneous characteristics, this eases the tuning of the parameters which were needed by the edge-detector algorithm. The main advantage of this method is that, it provides a better segmentation for non co-operative iris recognition. The major drawback in this method is that thorough (extensive) search is needed in order to recognize the circle parameters of both the pupil as well as the iris boundaries.

E. Pulling and Pushing (PP) Method

A perfect (accurate) as well as a rapid iris segmentation algorithm for iris biometrics has been developed in this. There are mainly five major contributions in this. Firstly, a novel reflection removal method has been developed in order to exclude the specularities involved in the input images, also an Adaboost-cascade iris detector has been used in order to detect the iris in them and also to exclude the non iris image parts before further processing such that redundant computations can be avoided. In addition to this, a rough iris center has been extracted in the iris images. Second contribution is that, beginning from the rough iris center, a novel puling and pushing (PP) [5] procedure has been developed in order to accurately localize the circular iris boundaries. The PP method directly finds the shortest path to the valid parameters. Third is that, a cubic smoothing spline has been adopted in order to deal with the noncircular iris boundaries. Fourth contribution is that, an efficient method for the localization of the eyelids has been developed. The main difficulties of eyelid localization difficulties such as sharp irregularity of eyelids as well as the noise due to the eyelashes has been addressed proficiently by a rank filter and also a histogram filter. Finally, the eyelashes as well as the shadows have been detected with statistically learned prediction model. The advantage of PP method is the accuracy and speed. The drawback of this method is that the occurrence of the segmentation error.

F. Eight-neighbor connection based clustering

An efficient as well as robust algorithm for noisy iris image segmentation in the background of non cooperative and less-cooperative iris recognition has been developed in this. The major contributions involved in this are as follows. Firstly, a novel region growing scheme known as the eight-neighbor connection based clustering [6] has been proposed in order to cluster the whole iris image into different parts. Then, genuine iris region has been extracted with the aid of several semantic priors, and also the non-iris regions such as eyelashes, eyebrow, glass frame, hair, etc are identified and also excluded as well, which intensely reduces the possibility of mis localizations occurring on the non-iris regions. Secondly, an integrodifferential constellation has been introduced inorder to accelerate the traditional integrodifferential operator, and then, enhance its global convergence ability for pupillary as well as the limbic boundary localization. Thirdly, a 1-D horizontal rank filter as well as an eyelid curvature model has been adopted in order to tackle the eyelashes as well as the shape irregularity, during eyelid localization. Finally, the eyelash as well as the shadow occlusions has been detected with the aid of learned prediction model which is based on the intensity statistics between different iris regions. The advantage of this method is that the iris segmentation accuracy has been attained. The drawback is segmentation of noisy iris images should be improved.

All these techniques have improved the performance of the iris recognition system. All these techniques acquire segmentation accuracy in many areas such as boundary detection, iris detection, pupil and limbic boundary detection etc. But none of these papers provide a solution for attaining overall segmentation accuracy. Thus there is an extreme need for developing a new segmentation method, which is more reliable as well as robust for automatically segmenting the non ideal iris images.

This paper introduces a unified solution for iris segmentation [9]. Here, a new iris segmentation framework has been developed, which can robustly segment the iris images attained using NIR or else the visible illumination. This approach exploits multiple higher order local pixel dependencies using Zernike moments (ZM), in order to strongly (robustly) classify the eye region pixels into iris or else the non iris regions using trained neural network/ support vector machine (NN/SVM) classifiers. Image enhancement using single scale retinex (SSR) algorithm has been employed for illumination variation problem. Face as well as the eye detection modules has been integrated in the unified framework to automatically provide the localized eye region from facial image for segmenting the iris. A robust post processing operations algorithm has been developed in order to effectively alleviate the noisy pixels which has been caused due to misclassification.

NAME	APPROACH	PERFORMANCE	DISADVANTAGES
High confidence visual recognition of persons by a test of statistical independence	Integrodifferential operator	High performance in iris recognition	Computational time is very high
Iris Recognition: An emerging biometric technology	Hough transform	Segmentation accuracy achieved up to an extent	Does not provide attention to EL as well as reflections etc
Recognition of Human Iris Patterns for Biometric Identification	Liber Masek's encoding algorithm	Localization of circular iris region as well as eyelids, eyelashes and also the reflections occurs	Speed of the system is low
Iris segmentation methodology for non cooperative recognition	Fuzzy clustering algorithm	Better segmentation for non co-operative iris recognition	Thorough search is needed to recognize the circle parameters of both pupil and iris boundaries
Toward Accurate and Fast Iris Segmentation for Iris Biometrics	Pushing and pulling (PP) method	Possess accuracy and speed	Occurrence of segmentation error
Efficient and robust segmentation of noisy iris images for non cooperative iris recognition	Eight-neighbor connection based clustering	iris segmentation accuracy has been attained to an extent	segmentation of noisy iris images should be improved

Table1: Comparison table on literature survey

III. CONCLUSION

This paper presents a literature survey on the various segmentation techniques involved in iris recognition. There are various techniques that can be used for this purpose. Overall segmentation accuracy of all these techniques has been analyzed. Higher the segmentation rate, thus higher is its performance. The unified framework [7] has the highest segmentation rate and also has highest performance.

IV. ACKNOWLEDGMENT

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REFERENCES

[1] J.G. Daugman, High confidence visual recognition of persons by a test of statistical independence, IEEE Transactions on Pattern Analysis and Machine Intelligence, 15, p.1148, Nov 1993

[2] R.P. Wildes, Iris recognition: An emerging biometric technology, Proceedings of the IEEE, 85 p.1348, sep. 1997

[3] L. Masek, "Recognition of Human Iris Patterns for Biometric Identification", M.S. Dissertation, The University of Western Australia, 2003

[4] H. Proença, L.A. Alexandre, "Iris segmentation methodology for non-cooperative recognition", IEE Proceedings of Vision, Image and Signal Processing, pp. 199-205, 2006

[5] Z. He, T. Tan, Z. Sun, and X. Qiu, "Toward accurate and fast iris segmentation for iris biometrics," IEEE Trans. Pattern Anal. Machine Intelligence, vol. 31, no. 9, pp. 1670–1684, Sep. 2009.

[6] T. Tan, Z. He, and Z. Sun, "Efficient and robust segmentation of noisy iris images for non-cooperative iris recognition," Image Vis. Comput., vol. 28, no. 2, pp. 223–230, Feb. 2010.

[7] Tan, C. and Kumar, A., Unified framework for automated iris segmentation using distantly acquired face images. IEEE Transactions on Image Processing, 21(9):4068–4079, Sep 2012

Effects of Agreement on Trims on Indian Foreign Trade

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ABSTRACT:

In the late 1980s, there was a significant increase in foreign direct investment throughout the world. However, some of the countries receiving foreign investment imposed numerous restrictions on that investment designed to protect and foster domestic industries, and to prevent the outflow of foreign exchange reserves. Examples of these restrictions include local content requirements, manufacturing requirements, trade balancing requirements, domestic sales requirements, technology transfer requirements, export performance requirements, local equity restrictions, foreign exchange restrictions, remittance restrictions, licensing requirements, and employment restrictions. These measures can also be used in connection with fiscal incentives as opposed to requirement. Some of these investment measures distort trade in violation of GATT Article III and XI, and are therefore prohibited. Until the completion of the Uruguay Round negotiations, which produced a well-rounded Agreement on Trade-Related Investment Measures, the few international agreements providing disciplines for measures restricting foreign investment provided only limited guidance in terms of content and country coverage. The Agreement contains transitional arrangements allowing Members to maintain notified TRIMs for a limited time following the entry into force of the WTO (two years in the case of developed country Members, five years for developing country Members, and seven years for least-developed country Members). The Agreement also establishes a Committee on TRIMs to monitor the operation and implementation of these commitments.

Key Words: *TRIMs, WTO, GATT, Foreign trade, DSB, Multilateral trade, and AALA*

I. INTRODUCTION:

Foreign trade is an engine of growth and innovation. It tends to optimize the use of world resources with every country specializing in the production of the commodity for which it is best suited according to natural and human resource endowment. It promotes more efficient employment of productive forces leading to extension of market, division of labour and specialization and promotes capital formation through import of technology. International trade thus leads to an increase in productivity and competitiveness and reduction of costs and thereby growth of nations.

From time immemorial, India had trade relations with several countries. But with the conquest of India by British the characteristics of India's traditional trade completely changed. The destruction of Indian industries and trade by the British coupled with destruction of agriculture converted Indian economy into a mere market for the goods manufactured by the factories of Britain. The same situation continued till independence. With the impressive industrial development since independence, India's foreign trade has undergone a radical change and is no longer confined to a few countries trading with few commodities.

In order to improve the trade links further, India became a founder member of the WTO. The WTO aims at the liberalization of world trade. In 1991, Indian government replaced the system of controls with liberalization, which alongside; globalization has become the buzzword. The new economic policy was devised to accelerate economic development, which is the consequence of the international developments resulted through the coming into force of the WTO and other agreements under its umbrella such as TRIMs, Antidumping etc.

Trade Related Investment Measures (TRIMS) refers to certain conditions or restrictions imposed by a government in respect of foreign investment in the country. Most developing countries impose such conditions on foreign investors. These impose obligations like use of specified percentage of locally produced raw material or components, local equity requirements, export performance and control on imports requiring foreign

investors to use domestic supplies. They are nothing but protective tariffs as they deny market access to a service industry wanting to invest in another country. To remove these restrictions the Agreement on Trade Related Investment Measures was negotiated in the Uruguay Round. The central objective is to promote expansion and progressive liberalization of world trade and to facilitate investment across international frontiers so as to ensure free competition and increasing economic growth of trading partners, particularly developing country members, while ensuring free competition.

II. WHAT IS THE AGREEMENT ON TRIMS?

The Agreement did not define TRIMs, but provided an illustrative list in the Annex.1. These illustrations of TRIMs are;

i) Local content requirements, where governments require enterprises to use or purchase domestic products;
ii) Trade balancing measures where governments impose restrictions on imports by an enterprise or link the amount of imports to the level of its exports.
iii) Foreign exchange balancing requirements where an enterprise has the level of imports linked to the value of its exports in order to maintain a net foreign exchange earning.

The Agreement also recognizes that certain investment measures restrict and distort trade. Hence it provides that no contracting party shall apply any TRIMs inconsistent with Article III (National Treatment) and XI (Prohibition of Quantitative Restrictions) of the GATT. The agreement requires the member countries, which have to observe the following;

1) The policy steps initiated by the member countries to regulate investments for the purpose of attainment of import substitution, export expansion and to control foreign exchange are considered to be against the very basic philosophy of GATT as these steps would act as major constraints in the promotion of free trade.
2) Investment regulatory steps are inconsistent with the aims of GATT 1994, hence are essentially required to be gradually removed by the signatories of the Agreement.
3) No need in the proposals to provide a preferential treatment to foreign investment and therefore, such investor will be subject to the same restrictions as other investors in regard to imports.
4) Government's ability to impose export obligations on foreign or domestic investors remains unimpaired as long as BOP crisis is there.

The Uruguay Round agreements do not affect any nations investment polices and this is an important aspect of TRIMs.

III. PROHIBITED MEASURES:

Along with that, an illustrative list of TRIMs agreed to be inconsistent with these articles is appended to the Agreement. The list includes measures, which require particular levels of local procurement by an enterprise, or which restrict the volume or value of imports that such an enterprise can purchase or use to an amount related to the level of products it exports. For the measures to be covered by the prohibition the general condition is that,

1) These are mandatory or enforceable under a domestic law or under administrative rulings, or
2) Compliance with these is necessary to obtain an advantage.

Measures inconsistent with Article III.4 of GATT 1994:

Measures mentioned in the Agreement on TRIMs as violating Article III.4 of GATT 1994 are the following:

i) Specifying that particular products of domestic origin must be purchased or used by an enterprise, or
ii) Specifying that a particular volume or value of some products of domestic origin must be purchased or used by an enterprise, or
iii) Specifying that an enterprise must purchase or use domestic products at least up to a particular proportion of the volume or value of the local production of the enterprise, or
iv) Restricting the purchase or use of an imported product by an enterprise to an amount related to the exports of local production.

First three are local content requirements and the fourth is an indirect requirement of partial balancing of foreign exchange outflow and inflows.

Measures Inconsistent with Article XI.1 of GATT 1994:

Measures inconsistent with Article XI.1 of GATT 1994, are specified in the Agreement on TRIMs as the following:

i) Imposing a general restriction on the import of inputs by an enterprise or restricting the import of inputs to an amount related to the export of its local production,

ii) Restricting the foreign exchange for the import of inputs by an enterprise to an amount related to the foreign exchange inflow attributable to the enterprise.

iii) Restricting exports by an enterprise by specifying the products so restricted the volume or value of products so restricted, or the proportion of its local production so restricted.

The first two are requirements of a partial balancing of foreign exchange, and the third is an export-restraint requirement for ensuring the domestic availability of the product.

IV. EXCEPTIONS:

Several allegations have been made against the TRIMs agreement. It prevents the imposition of any performance clauses on foreign investors in respect of earning foreign exchange, foreign equity participation and transfer of technology. It requires foreign companies to be treated on par with or even better than local companies; it prevents the imposition of restriction on areas of investment and it requires the free import of raw materials, components and intermediates. But under this agreement, even though the members are required to eliminate the use of TRIMs that are inconsistent with Article III or Article XI of GATT 1994, some exceptions are given.

A developing country member is allowed temporary deviation from these obligations under Article XVIII. This Article deals with balance of payment provisions, allow flexibility in respect of restraining the import of a product, but once a product is imported, it will have to be given national treatment. There can be no discrimination between the imported product and the like domestic product in respect of their use.

In exceptional circumstances the ministerial conference may decide to waive an obligation imposed on a member by this Agreement or any of the multilateral trade agreements provided that any such decision shall be taken by three fourths of the members unless provided for the below.

a) A request for waiver concerning this agreement shall be submitted to the ministerial conference for consideration pursuant to the practice of the decision-making by consensus. The ministerial conference shall establish a time period, which shall not exceed 90 days, to consider a request. If consensus is not reached during the time period, any decision to grant a waiver shall be taken by three fourth of the members.

b) A request for a waiver concerning multilateral trade agreements in annexes 1A, 1B or 1C and their annexes shall be submitted initially to the council for trade in goods during a time period which shall not exceed 90 days. At the end of the time period, the relevant council shall submit a report to the ministerial conference.

A decision by the ministerial conference granting a waiver shall state the exceptional circumstances justifying the decision.

Moreover, the TRIMs agreement specifically provides, however, that exceptions permitted under the GATT continue to apply. This could mean, for instance, that a TRIMs otherwise banned might be justifiable for reasons of national security.

V. ELIMINATION OF NOTIFIED TRIMS:

The agreement demands that all TRIMs inconsistent with its provision be notified and eliminated over a set period. The agreement requires the mandatory notification of all non-conforming TRIMs and their elimination within two years for developed countries, within five years for developing countries and within seven years for least developed countries. It establishes committees on TRIMs, which will, among other things, monitor the implementation of these commitments. The Agreement also provides for consideration, at a later date, of whether it should be complimented with provisions on investment and competition policy more broadly.

However, Article 5.3 of the Agreement provides that the council for Trade in Goods may extend the transition period at the request of an individual developing or least developed the council for Trade in Goods shall take into account the individual development, financial and trade needs of the member in question. It is further provided that during the transition period, a member shall not modify the terms of any TRIMs, which it notified under paragraph 1 from those prevailing at the date of entry into force of the WTO agreement, so as to increase the degree of inconsistency with the provisions of Article 2.

Measures, which were introduced within 180 days prior to the coming into force of the WTO Agreement, will have to be eliminated immediately, as a member does not have the benefit of the time schedule provided in respect of these measures.

VI. EQUITABLE PROVISIONS:

To avoid damage to the competitiveness of companies, during the transitional period, some equitable provisions are also provided in the WTO agreement. A member may apply such measures during the time schedule to new enterprises, which would produce like products if it is necessary to avoid distortion to the condition of competition between the new enterprises and established enterprises. Any TRIMs so applied shall be notified to the council for Trade in Goods. The terms of such TRIMs shall be equivalent in their competitive effect to those applicable to the established enterprises, and it shall be terminated at the same time.

Theoretically the Uruguay Round of Agreement has strengthened the world economic reforms. It encourages the trade flows worldwide and strengthened rules relating to anti dumping, subsidies and countervailing measures which is likely to ensure greater security and predictability of international trading system. But from the view point of developing and under developed countries, this agreement has not yielded the projected benefits.

VII. THE WTO IN THE EYES OF INDIA- A BOON OR BANE!

It has been repeatedly claimed that the national interests were not protected in the WTO negotiations. The implementation of the results of this round would retard industrial growth, discriminate small-scale industries, ruin the lives of artisans and choke the development of the agricultural sector. It has also been urged that foreign imports and enterprises would come to dominate every aspect of economic life while domestic sectors would be left to face slow and lingering death. WTO has been depicted as a supranational institution that is eroding the sovereignty of the country and primarily of its parliament. Even there is a force on the Government of India to quit the membership of the WTO to protect the economic interest of the country. The more important and often cited reason is the unequal bargaining strength of trading nations, based on their share in world trade, with larger developed nations more able to influence terms of agreements than smaller LDCs.

Free multilateral trade based on non-discrimination has been a mantra that has been used to force developing countries to fall in line with the trade regimes built to meet the developed countries. History reveals with reference that developed countries have violated this principle as and when their general and sectoral interests get adversely affected. When the developing countries emerged as competitors in some products, the developed countries did not hesitate to abandon the principle of free non-discriminatory multilateral trade.

It is believed that there are number of advantages. First, it is the most progressive instrument for world economic reforms. It soothens trade flows worldwide, which in turn holds promise of enormous increase in trade opportunities and volume of world trade, much higher growth rate of world economy and increase in income and employment worldwide. Second, WTO would save weaker countries from bilateral excesses and arbitrariness that characterizes strong countries notably, USA in dealing with their weaker trading partners. Third, WTO is also going to act as a sort of international court of justice for settling trade disputes among member nations. It is possible that, the developing countries can get justice against the arbitrary acts of developed countries.

But in reality, the “opportunity for all” slogan of Uruguay Round of GATT is contrary to an ordinary business life. In business, there is no scope for opportunity for all because there should be some losers to assure gains to some body. Even the concepts like ‘free trade’ and ‘liberalization’ are only catchy slogan-traps flashed by North to attract the AALA (Asia, Africa, and Latin America) countries into a “global village trap”. Since the establishment of the WTO, national governments have become mere “Sepoys” to carry out the dictates of the MNCs routed through the WTO. The GATT Final Act was only a global document to legitimate this activity of the MNCs.

Further it has been observed that India has been opening up its markets to a much greater extent than others are opening up their markets. But the developed countries want to categories India and some of other developing countries as advanced developing countries and to deny them some of the potential relief's that might have been originally designed under the S and D clause.

The Agreement on TRIMs is mainly concerned with provisions for elimination of TRIMs, which are designed to protect the interests of the foreign investors in the developing countries. No doubt the developing countries have been permitted to deviate from the provisions of TRIMs Agreement, on grounds of balance of payment, but several times the DSB of the WTO had ruled against our contention of balancing of payment in automotive sector policy and India being a developing country could not reap the benefits of these provisions. Even the ministerial conferences could not gain effective results in all these years. The very concept of national sovereignty had also turned sublime by the acceptance of the provisions of WTO Agreement by India.

VIII. CONCLUSION:

The Agreement on Trade Related Investment Measures (TRIMs) is a set of rules that apply to the domestic regulations a country applies to foreign investors, often as part of an industrial policy. The agreement was agreed upon by all members of the WTO. Normally all the countries impose some restrictions on the imports and exports to promote their foreign exchange. Such measures may hinder the growth of foreign trade to prevent such hindrance, all the member countries agreed to prohibit some measures under the agreement on Trade Related Investment Measures. Hence policies such as local content requirements and trade balancing rules that have traditionally been used to both promote the interests of domestic industries and combat restrictive business practices are now banned. Special provisions were made for the developing and least developed countries, and given some facilities under these Agreements. Any member country can deviate from the provisions of the WTO to meet out its BOP problems. Provision for revision of existing measures from time to time was also recognized. Through Ministerial Conferences, the member countries can complain, or suggest for the required changes in the provisions of World Trade Organization.

India being a founder member of the WTO, with an aim to get benefits, agreed to accept all agreements. To comply with the provisions of these agreements structural adjustments were made to the existing laws. Through amendments the provisions of customs laws has been modified. Indian government liberalized its trade sector to fulfill the requirements of these provisions. It has opened its doors to foreign investors and multinational companies, by accepting the proposal of globalization. The text of all the agreements makes the person to believe that, all the provisions are carefully framed and by obliging such provisions the country could attain economic prosperity. But in reality, there are several lacuna in the agreement and there is no proper implementation of the provisions. With a dream to have successful trade relations with other countries India has opened up its market for foreigners. However, India's gain will be much less than those of several other developing countries. India's exports in some areas are decreasing every year, on the other hand, quantity of imports are increasing.

Even the dispute settlement body has not given justice to India in many cases. Developing countries from the beginning were placed in a no win situation. Now it is believed that, it is a waste of time and money for India to invoke the WTO's dispute settlement procedure against industrial countries. Even if, India obtains a clear legal ruling that an industrial country has violated legal obligations, we have no effective way to enforce it. On the contrary, if India violates any of the obligations, the developed nations can effectively take retaliation actions against India. Further, we could not achieve much in the ministerial conferences held so far and the World Trade Organization failed to fulfill our aspirations. Finally we have to accept the truth that neither we can take actions against the MNCs under the agreements of WTO nor can invoke the dispute settlement procedure.

REFERENCES

[1] B.K. Chaudhuri, "*Finance of Foreign Trade and Foreign Exchange*", 3rd ed., Mumbai; Himalaya Publishing House, 1997. p.101

[2] Francis Cherunilam, "*International Business*", 3rd ed, New Delhi: Prentice Hall of India Pvt. Ltd, 2004, p. 201.

[3] N.K. Chowdhury and J.C. Agarwal, "*Dunkel Proposals, Implications of India and the third world",* 1st ed., Delhi: Shipra Publications, 1994, p.189.

[4] http://www.bti.gov.uk/ewt/trims.pdf

[5] http://www.bti.gov.uk/ewt/trims.pdf

[6] Dr. Badar Alam Iqbal, "*WTO and the Promotion of Global Trade*", Vol. 32, No. 1, Chartered Secretary 2002, p. 42.

[7] Rohan Shah, *"WTO, India and you*" 1 st ed., Economic Law Practice,2003, p. 33.

[8] Arun Goyal,"WTO the new millenium", 3rd ed., Delhi: Academy of business Studies, 2000,pp. 141-142.

[9] Rajiv Anand, "*Uruguay Round Text in Perspective*", Vol. 27, No. 18, EPW, 1992, p. 967.

[10] WTO, *Annual Report 2000*; WTO publication, Geneva.

[11] http://www.oecd.org/dataoecd/51/45/2392/306.pdf
[12] A decision to grant a waiver in respect of any obligation subject to a transition period for staged implementation that the requesting Member has not performed by the end of the relevant period shall be taken only by consensus.
[13] http://www.twnside.org.sg/title/goods-htm
[14] WTO, *Annual Report2000*; WTO Publication, Geneva.
[15] Jayantha Bagchi "*World Trade Organisation*",1st ed.,Calcutta:P.M. Bagchi and Co. Pvt. Ltd ,2000, p. 36.
[16] Report on GATT Agreement, pp. 151-152.
[17] http://www.wto.sice.oas.org/ctyindex/wto/tpreme64.asp
[18] Prakashchandra and Prem Arora, "*Bookhieve's Comparative Politics and International relations*", 21st ed, Gurgaon: Cosmos Bookhieve (P). Ltd, 2003, p. 279.
[19] Sanjay Bagchi, *"India and the WTO: Secretarion Interests Versus Public Good"*, Vol. 36, No. 2, EPW, 2001, p. 90.
[20] C.A. Ananth, "*India and the WTO-Flawed Rejectionist Approach*", Vol. 36, No. 45, EPW, 2001, p. 4243.
[21] Anonymous, "*WTO Framework Deal Removes Fear That Emerging Pattern would Harm India's Farm Sector"*, Vol. 50, No. 1, Monthly Public Opinion Surveys, 2004, p.9.
[22] Jagadish Bhagwathi, "*WTO and India: An Agenda for Action in Post Doha Scenario"*, CUTS, 2002, p.103.
[23] S.R. Sen, *"From GATT to WTO", Vol. 29*, No. 43, EPW, 1994, p. 2804.
[24] Jagadish Bhagwathi, "*Trading for Development: How to assist Poor Countries*", "*Doha and Beyond, the future of multitrading system*", 1st ed, Cambridge: University Press, 2004, p. 116.
[25] Ruddar Dutt, "*WTO and the Role India Should Play*", Vol. 39, No. 11, Main Stream, 2001, p. 23.
[26] Anonymus, "*Ghost of Cancun Still Haunts WTO*", Vol. 40, No. 9, Monthly Public Opinion Surveys, 2005, p.13.
[27] A.K. Roy, "*Quit WTO Agenda for Mid Term Election",* Vol. 34, No. 26, EPW, 1999, p. 1661.
[28] Vijaya Shrimali, "*Need to Revise Agreement on TRIMs*", Vol. 44, No. 4, Southern Economist, 2005, p. 45.
[29] Sachin Chaudhuri, "*Wrong on WTO*", Vol. 36, No. 45, EPW, 2001, p. 4235.
[30] Latheef Kizhisseri, *"WTO: Who Gained and Who Lost*?", Vol.39,No.s47-49, Main Stream,2001, p. 18.

A Novel Approach to Mine Frequent Item sets of Process Models for Dyeing Process using Association Rule Mining

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ABSTRACT:

A noval approach of process mining provides a new means to improve processes in a variety of application domains these process mining techniques help organizations to uncover their actual business processes in this presented paper. Dyeing process using apriori algorithm. but apriori algorithm has some drawback like more execution time, can not handle the large amount of data Now, we propose modified apriori algorithm that applied in dyeing process model to generate frequent pattern and remove the drawback of apriori algorithm in term of execution time, handle the large amount of data. We proposed work Evaluating and analyzing the usefulness and application of the association rule mining algorithms and as it was implemented to obtain simpler process models for the dyeing domain. In view of performance the proposed algorithm for frequent patterns discovery are, it reduces the size of the database after second pass and, the storage space and saves the computing time. this Proposed work has an excellent performance for various kinds of application marketing,medicine,e-commerce,web mining,bio informatics to create frequent patterns, outperforms currently available algorithms in dyeing processing systems, and is highly scalable to mining large databases.

Keyword: *frequent pattern mining dyeing process model, confidence, database, association rule*

I. INTRODUCTION

Data mining is one of the most dynamic emerging research in today's database technology and Artificial Intelligent research; the main aim is to discover valuable patterns from a large collection of data for users. In the transaction database, mining association rule is one of the important research techniques in data mining field. The original problem addressed by association rule mining was to find the correlation among sales of different items from the analysis of a large set of super market data. Right now, association rule mining research work is motivated by an extensive range of application areas, such as banking, manufacturing, health care, medicine, and telecommunications. There are two key issues that need to be addressed when applying association analysis. The first one is that discovering patterns from a large dataset can be computationally expensive, thus efficient algorithms are needed.. We propose a new dynamic algorithm for frequent pattern mining in which database represented in transposed form. And for counting the support we find out by longest common subsequence approach and after finding pattern longest common subsequence is stored or update in database so that next time instead of whole transaction we search from these filter transaction string.. The frequent pattern mining algorithms are applied in the dyeing process due to difficulties of doing the coloring process in an efficient way. Apriori algorithm can significantly reduce mining time by generating pattern candidates that had successfully brought many researchers' attention [1].These frequent patterns have a confidence for different treatments of the dyeing process. These confidences help the dyeing unit expert called dyer to predict better combination or association of treatments. This article also proposes to modify the APriori algorithm to the dyeing process of dyeing unit, which may have a major impact on the coloring process of dyeing industry to process their colors effectively without any dyeing problems, such as pales, dark spots on the colored yarn.

II. RELATED WORK

These process mining techniques help organizations to uncover their actual business processes. Process mining is not limited to process discovery. The frequent pattern mining plays an essential role in many data mining tasks and applications, such as mining association rules, correlations [5], sequential patterns [6], episodes [7], multidimensional patterns [8], max patterns and frequent closed patterns [9], partial periodicity [10], emerging patterns [11], classification [12] and clustering [13]. The numerous studies on the fast mining of frequent patterns can be classified into following categories.

2.1 candidate generation and test approaches,

candidate generation and test approaches such as Apriori and many subsequent studies, are directly based on an anti-monotone Apriori property [1] if a pattern with k items is not frequent, any of its super-patterns with (k + 1) or more items can never be frequent. A candidate generation and test approach iteratively generates a set of candidate patterns of length (k + 1) from a set of frequent patterns of length k ($k \geq 1$), and checks their corresponding occurrence frequencies in the database.

2.2 pattern-growth methods

The second category of methods, pattern-growth methods, such as FPGrowth [14] and Tree Projection have been proposed. A pattern-growth method uses the Apriori property. However, instead of generating candidate sets, it recursively partitions the database into sub-databases according to the frequent patterns found and searches for local frequent patterns to assemble longer global ones. However, these algorithms may still encounter some difficulties in different cases..

2.3 HMine to mine frequent patterns

In 2001 J. Pei [3] proposed an algorithm called HMine to mine frequent patterns efficiently on a sparse dataset. This algorithm utilizes H-Struct data structure, which has very limited and predictable space overhead, and runs very fast in memory setting, hence modified this algorithm with link structure and reverse order processing.

III. CLASSICAL ALGORITHM USED FOR DYING PROCESS

3.1 Sequential Algorithms

3.1.1 AIS Algorithm

The AIS algorithm was the first published algorithm developed to generate all large itemsets in a transaction database [Agrawal1993]. This technique is limited to only one item in the consequent. That is, the association rules are in the form of $X \Rightarrow I_j \mid \alpha$, where X is a set of items and I_j is a single item in the domain I, and α is the confidence of the rule.

3.1.2 Apriori

the Apriori algorithm developed by [Agrawal1994] is a great achievement in the history of mining association rules [Cheung1996c]. This technique uses the property that any subset of a large item set must be a large itemset.In the first pass, the item sets with only one item are counted. The discovered large item sets of the first pass are used to generate the candidate sets of the second pass using the apriori _gen() function. Once the candidate item sets are found, their supports are counted to discover the large item sets of size two by scanning the database. In the third pass, the large item sets of the second pass are considered as the candidate sets to discover large item sets of this pass. This iterative process terminates when no new large item sets are found. Each pass *i* of the algorithm scans the database once and determines large itemsets of size *i*. L_i denotes large item sets of size *i*, while C_i is candidates of size *i*. The apriori_gen() function as described in [Agrawal1994] has two steps. During the first step, L_{k-1} is joined with itself to obtain C_k. In the second step, apriori_gen() deletes all item sets from the join result, which have some (k-1)–subset that is not in L_{k-1}. Then, it returns the remaining large k-item sets.

Method: apriori_gen() [Agrawal1994]
Input: set of all large (k-1)-itemsets L_{k-1}
Output: A superset of the set of all large k-itemsets //Join step
I_i = Items iinsert into C_k
Select $p.I_1$, $p.I_2$, ……., $p.I_{k-1}$, $q.I_{k-1}$ From L_{k-1} is p, L_{k-1} is q
Where $p.I_1 = q.I_1$ and …… and $p.I_{k-2} = q.I_{k-2}$ and $p.I_{k-1} < q.I_{k-1}$. //pruning step
For all itemsets $c \in C_k$ do
for all (k-1)-subsets s of c do
If ($s \notin L_{k-1}$) then
delete c from C_k

Consider the example given in Table 4 to illustrate the apriori_gen(). Large item sets after the third pass are shown in the first column. Suppose a transaction contains {Apple, Bagel, Chicken, Eggs, DietCoke}. After joining L_3 with itself, C_4 will be {{Apple, Bagel, Chicken, DietCoke}, {Apple, Chicken, DietCoke, Eggs}. The prune step deletes the item set {Apple, Chicken, DietCoke, Eggs} because its subset with 3 items {Apple, DietCoke, Eggs} is not in L_3. The subset() function returns subsets of candidate sets that appear in a transaction. Counting support of candidates is a time-consuming step in the algorithm [Cengiz1997]. To reduce the number of candidates that need to be checked for a given transaction, candidate item sets C_k are stored in a hash tree. A node of the hash tree either contains a leaf node or a hash table (an internal node). The leaf nodes contain the candidate item sets in sorted order. The internal nodes of the tree have hash tables that link to child nodes. Item sets are inserted into the hash tree using a hash function. When an item set is inserted, it is required to start from the root and go down the tree until a leaf is reached. Furthermore, L_k is stored in a hash table to make the pruning step faster [Srikant1996b]
Algorithm 3 shows the Apriori technique. As mentioned earlier, the algorithm proceeds iteratively.

Large Item sets in the third pass (L_3)	Join (L_3, L_3)	Candidate sets of the fourth pass (C_4 after pruning)
{{Apple, Bagel, Chicken}, {Apple, Bagel, DietCoke}, {Apple, Chicken, DietCoke}, {Apple, Chicken, Eggs}, {Bagel, Chicken, DietCoke}}	{{Apple, Bagel, Chicken, DietCoke}, {Apple, Chicken, DietCoke Eggs}}	{{Apple, Bagel, Chicken, DietCoke}}

Table 5.1 :Finding Candidate Sets Using Apriori_gen()

Function count(C: a set of itemsets, D: database)
begin
for each transaction $T \in D = \bigcup D^i$ **do begin**
forall subsets $x \subseteq T$ **do**
if $x \in C$ **then**
x.count++;
end

Algorithm 3. Apriori [Agrawal1994]
Input:
I, D, s
Output:
L

Algorithm:

//Apriori Algorithm proposed by Agrawal R., Srikant, R. [**Agrawal1994**]//procedure LargeItemsets

1) C_1: = I; //Candidate 1-itemsets

2) Generate L_1 by traversing database and counting each occurrence of an attribute in a transaction;

3) **for** (k = 2; $L_{k-1} \neq \phi$; k++) **do begin**//Candidate Itemset generation

//New k-candidate itemsets are generated from (k-1)-large itemsets

4) C_k = apriori-gen(L_{k-1});//Counting support of C_k

5) Count (C_k, D)

6) $L_k = \{c \in C_k \mid c.count \geq minsup\}$

7) **end**

Initially, each item of the itemset is considered as a 1-item candidate itemset. Therefore, C_1 has four 1-item candidate sets which are {Bread}, {Butter}, {Eggs}, and {Milk}. L_1 consists of those 1-itemsets from C_1 with support greater than or equal to 0.4. C_2 is formed by joining L_1 with itself, and deleting any itemsets which have subsets not in L_1. This way, we obtain C_2 as {{Bread Butter}, {Bread Eggs}, {Butter Eggs}}. Counting support of C_2, L_2 is found to be {{Bread Butter}, {Butter Eggs}}. Using apriori_gen(), we do not get any candidate itemsets for the third round. This is because the conditions for joining L_2 with itself are not satisfied.

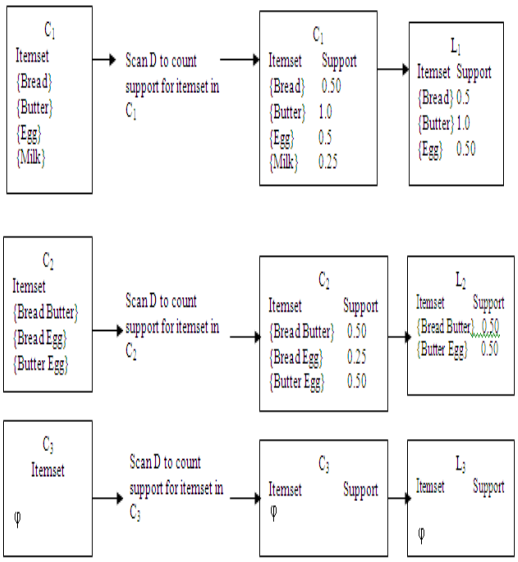

Figure 1 Discovering Large Itemsets using the Apriori Algorithm

4. PROPOSED SCHEME

Association rule mining is a popular and well researched area for discovering interesting relations between variables in large databases. We have to analyze the coloring process of dyeing unit using association rule mining algorithms using frequent patterns. Various algorithms are used for the coloring process of dyeing unit using association rules. For example. LRM, FP Growth Method., H-Mine and Aprori algorithm But these algorithm significantly reduces the size of candidate sets. However, it can suffer from three-nontrivial costs:

(1) Generating a huge number of candidate sets, and
(2) Repeatedly scanning the database and checking the candidates by pattern matching.
(3) It take more time for generate frequent item set.

Apriori algorithm, in spite of being simple and clear, has some limitation. It is costly to handle a huge number of candidate sets. . This is the inherent cost of candidate generation, no matter what implementation Technique is applied. It is tedious to repeatedly scan the database and check a large set of candidates by pattern matching, which is especially true for mining long patterns. Apriori Algorithm Scans the database too many times, When the database storing a large number of data services, the limited memory capacity, the system I/O load, considerable time scanning the database will be a very long time, so efficiency is very low. We have to proposed such that algorithm that it has a very limited and precisely predictable main memory cost and runs very quickly in

memory-based settings. it can be scaled up to very large databases using database partitioning. and to identify the better dyeing process of dyeing unit. In this paper, previous work is based on apriori algorithm in dyeing process of dyeing unit. So basic apriori algorithm are following

4.1 Limitation of Current State of Art.

Current security systems are facing challenges like The drawback of algorithm is

a) More time for execution
b) Less efficient on the larger size datasets
c) Slow and provide low accuracy

4.2 Algorithm Description

The Apriori algorithm had a major problem of multiple scans through the entire data. It required a lot of space and time. The modification in our paper suggests that we do not scan the whole database to count the support for every attribute. This is possible by keeping the count of minimum support and then comparing it with the support of every attribute. The support of an attribute is counted only till the time it reaches the minimum support value. Beyond that the support for an attribute need not be known. This provision is possible by using a variable named flag in the algorithm. As soon as flag changes its value, the loop is broken and the value for support is noted. In proposed algorithm, to calculate the support, we count the common transaction that contains in each element's of candidate set, with the help of the intersect query. In this approach, we have applied a constraints that we will consider only those transaction that contain at least k items,not less than k in process of support counting for candidate set of k length. This approach requires the proposed algorithm improvement mainly concentrated on (1) for reducing frequent itemset and (2) for reducing storage space as well as the computing time. In the case of large datasets like Wal-Mart datasets, the proposed algorithm is very much useful for reducing the frequent patterns and also reducing the database size for every subsequent passes. For example, in the improved algorithm, the number of occurrence of frequent k-itemsets when k-itemsets are generated from (k-1)-itemsets is computed. If k is greater than the size of the database D, there is no need to scan database D which is generated by (k-1)-itemsets according to the Aprior property and it can be remove automatically. Very less time as compared to all other approaches.

4.2.1 PROPOSED ALGORITHM

Algorithm 1: *Improved Algorithm*

Input: A transposed database D^T and the user defined minimum support threshold s.

Output: The complete set of frequent patterns

Step 1: Convert Database D into transpose form D^T

Step 2: Compute CT_1 candidate transaction sets of size-1 and finds the support count.

Step 3:Compute the large transaction sets (LT) of size-1.

(i.e., for all *CT1* is greater than or equal to minimum support.)

LT_1 = {Large 1-transaction set (LT)};

For (k=2; LT_{k-1} = 0; k++) do

Begin

$CTk = Apriori\text{-}gen(LT_{k-1}, ct)$;

//new candidate transaction sets

End

Return $LT = \cup_k LT_k$;

Algorithm2:*Apriori-gen*($LTk-1$),Generate candidate sets

For all transactions p $\in LT_{k-1}$ do begin

For all transactions q $\in LT_{k-1}$ do begin

If p.transaction1 = q.transaction,..., p.transactionk-2=q.transactionk-2, p.transactionk-1< q.transactionk-1 then

Begin

ct=p ∞ q;

If $has\_infrequent\_subset(ct, LT_{k-1})$ then

delete ct;

Else
For all transaction set $t \in D^T$ do begin
If count(t) <k then delete t;
Else begin
$Ct=subset(CT_k, t)$;
End; End

For all candidate transactions $ct \in CT_i$ do begin
$CT.count = CT.count + 1$;
End; End;
$LTk = \{ct \in CT_k \mid CT.count \geq s\}$;
End; End;
End; End;
Return CT_k;

Algorithms3has_infrequent_subset(ct, LT_{k-1}) //checking the elements of candidate generation
For all (k-1)-sub transaction set of ct do
Begin
If $t \in LT_{k-1}$ then return true;
else return false;
End.

The main advantage of the proposed algorithm for frequent patterns discovery are, it reduces the size of the database after second pass and, the storage space and saves the computing time.

IV. PERFORMANCE ISSUE OF APRIORI ALGORITHM & MODIFIED APRIORI ALGORITHM

To evaluate the efficiency and effectiveness of the improved algorithm, we performed an extensive study of two algorithms: Apriori-like and improved algorithm, on both real time synthetic data sets with different ranges Now, we compare the association rules mining algorithms on the whole data set with 5000 data set Now we implement the association rules that Apriori algorithm is more efficient which takes less time, less memory and hence results in high efficiency The experimental results shows improvement in generation of candidate sets, results in reduced number of data base scan, and also the time and space consumption. we calculate support and confidence
Support= (XUY).count/n
Confidence= (XUY).count/X.count

Database Size	Apriori Algorithm Time(ms)	Modified apriori algorithm Time(ms)
200	400	300
400	550	410
600	630	520
800	690	540
1000	750	590

Table6.6 Support and Confidence value of modified Apriori algorithm

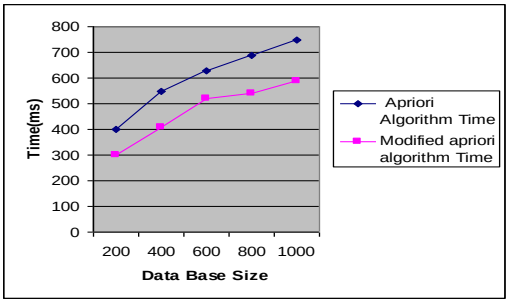

Fig 7.3: Support and Confidence value of modified Apriori algorithm

V. CONCLUSION

Frequent pattern mining is the first step for association rule mining. Association rule mining has found many applications other than market basket analysis, including applications in marketing, customer segmentation, medicine, e-commerce, classification, clustering, web mining, bioinformatics and finance. Various techniques have been found to mine frequent patterns.. It takes less memory by representing large database in compact tree-structure. But a word of caution here that association rules should not be used directly for prediction without further analysis or domain knowledge. They are, however, a helpful starting point for further exploration & understanding of data. Experimental results have shown advantages of Primitive Association Rule Mining over modified Apriori. There are a number of future research directions based on the work presented in this paper. Using constraints can further reduce the size of item sets generated and improve mining efficiency. This scheme was applied in retailer industry application, trying other industry is an interesting field for future work. This scheme use Maximal Apriori and FP-Tree. We can use other combination to improve this approach.

REFERENCE

[1.] A new approach for sensitive association rules hiding by Mohammad Naderi ehkordi, Kambiz Badie, Ahma Khade Zadeh in of International Journal Rapid Manufacturing 2009 - Vol. 1, No.2 pp. 128 – 149

[2.] Privacy Preserving Fuzzy Association Rules Hiding in Quantative Data by Manoj Gupta and R C Joshi in International Journal of Computer Theory and Engineering, Vol. 1, No. 4, October, 2009

[3.] Agarwal CC. and Yu PS., "Privacy-preserving data mining: Modeland Algorithms, (editors)CharuC.Aggarwal and Philip S. Yu, ISBN: 0-387- 70991-8, 2008

[4.] Vassilios S. Verykios,, Ahmed K. Elmagarmid , Elina Bertino, Yucel Saygin, Elena Dasseni. "Association Rule Hiding", IEEE Transactions on knowledge and data engineering, Vol.6, NO.4, April 2004

[5.] Shyue-Liang Wang, Yu-Huei Lee, Billis S., Jafari, A. "Hiding sensitive items in privacy preserving association rule mining", IEEE International Conference on Systems, Man and Cybernetics, Volume 4, 10-13 Oct. 2004 Page(s): 3239 – 3244

[6.] Brin, S., Motwani, R. and Silverstein, C. "Beyond market basket: Generalizing association rules to correlations", in the Proceedings of the 1997 ACM-SIGMOD International Conference on the Management of Data (SIGMOD'97), Tucson, AZ, 1997, pp. 265–276.

[7.] Agrawal, R. and Srikant, R. "Mining sequential patterns", in the Proceedings of the 1995 International Conference on the Data Engineering (ICDE'95), 1995. pp. 3–14.

[8.] Mannila, H., Toivonen, H. and Verkamo, A.I. Discovery of frequent episodes in event sequences. Data Mining and Knowledge Discovery, 1997, pp. 259–289.

[9.] Kamber, M., Han, J. and Chiang, J.Y. "Meta rule-guided mining of multidimensional association rules using data cubes", in the Proceedings of the 1997 International Conference on Knowledge Discovery and Data Mining (KDD'97), Newport Beach, CA, 1997, pp. 207–210.

[10.] Bayardo, R.J. "Efficiently mining long patterns from databases", in the Proceedings of the 1998 ACM- SIGMOD International Conference on the Management of Data (SIGMOD'98), Seattle, WA, 1998, pp. 85–93.

[11.] Han, J., Dong, G. and Yin, Y. Efficient mining of partial periodic patterns in time series database, in Proceedings of the 1999 International Conference on Data Engineering (ICDE'99), Sydney, Australia, 1999, pp. 106–115.

[12.] Dong, G. and Li, J. "Efficient mining of emerging patterns: discovering trends and differences", in Proceedings of the 1999 International Conference on Knowledge Discovery and Data Mining (KDD'99), San Diego, CA, 1999, pp. 43–52.

[13.] Liu, B., Hsu, W. and Ma, Y. "Integrating classification and association rule mining", in the Proceedings of the 1998 International Conference on Knowledge Discovery and Data Mining (KDD'98), 1998, New York, NY, pp. 80–86.

[14.] Agrawal, R., Gehrke, J., Gunopulos, D. and Raghavan, P. "Automatic subspace clustering of high dimensional data for data mining applications", in the Proceedings of the 1998 ACM-SIGMOD

Modeling and Analysis of the Crankshaft Using Ansys Software

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ABSTRACT:

Crankshaft is large volume production component with a complex geometry in the Internal Combustion (I.C) Engine. This converts the reciprocating displacement of the piston in to a rotary motion of the crank. An attempt is made in this paper to study the Static analysis on a crankshaft from a single cylinder 4-stroke I.C Engine. The modelling of the crankshaft is created using CATIA-V5 Software. Finite element analysis (FEA) is performed to obtain the variation of stress at critical locations of the crank shaft using the ANSYS software and applying the boundary conditions. Then the results are drawn Von-misses stress induced in the crankshaft is 15.83Mpa and shear stress is induced in the crankshaft is 8.271Mpa. The Theoretical results are obtained von-misses stress is 19.6Mpa, shear stress is 9.28Mpa. The validation of model is compared with the Theoretical and FEA results of Von-misses stress and shear stress are within the limits. Further it can be extended for the different materials and dynamic analysis, optimization of crank shaft.

Keywords: *Crankshaft, finite element analysis (FEA), ANSYS Software, Static Analysis;*

I. INTRODUCTION:

Crank shaft is a large component with a complex geometry in the I.C engine, which converts the reciprocating displacement of the piston to a rotary motion with a four bar link mechanism. Crankshaft consisting of shaft parts, two journal bearings and one crankpin bearing. The Shaft parts which revolve in the main bearings, the crank pins to which the big end of the connecting rod are connected, the crank arms or webs which connect the crank pins and shaft parts. In addition, the linear displacement of an engine is not smooth; as the displacement is caused by the combustion chamber therefore the displacement has sudden shocks. The concept of using crankshaft is to change these sudden displacements to as smooth rotary output, which is the input to many devices such as generators, pumps and compressors. It should also be stated that the use of a flywheel helps in smoothing the shocks.

Crankshaft experiences large forces from gas combustion. This force is applied to the top of the piston and since the connecting rod connects the piston to the crank shaft, the force will be transmitted to the crankshaft. The magnitude of the forces depends on many factors which consist of crank radius, connecting rod dimensions, weight of the connecting rod, piston, piston rings, and pin.

Combustion and inertia forces acting on the crankshaft. 1. Torsional load 2. Bending load. Crankshaft must be strong enough to take the downward force of the power stroke without excessive bending so the reliability and life of the internal combustion engine depend on the strength of the crankshaft largely.

The crank pin is like a built in beam with a distributed load along its length that varies with crank positions. Each web is like a cantilever beam subjected to bending and twisting. 1. Bending moment which causes tensile and compressive stresses. 2. Twisting moment causes shear stress.

There are many sources of failure in the engine one of the most common crankshaft failure is fatigue at the fillet areas due to the bending load causes by the combustion. The moment of combustion the load from the piston is transmitted to the crankpin, causing a large bending moment on the entire geometry of the crankshaft. At the root of the fillet areas stress concentrations exist and these high stress range locations are the points where cyclic loads could cause fatigue crank initiation leading to fracture.

II. LITERATURE REVIEW:

Rinkle garg and Sunil Baghl. [1] have been analyzed crankshaft model and crank throw were created by Pro/E Software and then imported to ANSYS software. The result shows that the improvement in the strength of the crankshaft as the maximum limits of stress, total deformation, and the strain is reduced. The

weight of the crankshaft is reduced .There by, reduces the inertia force. As the weight of the crankshaft is decreased this will decrease the cost of the crankshaft and increase the I.C engine performance.

C.M. Balamurugan et al [2] has been studied the Computer aided Modelling and Optimization of crankshaft and compare the fatigue performance of two competing manufacturing technologies for automotive crankshafts, namely forged steel and ductile cast iron. The Three dimensional model of crankshaft were created by solid edge software and then imported to Ansys software. The optimisation process included geometry changes compatible with the current engine, fillet rolling and results in increased fatigue strength and reduced cost of the crankshaft, without changing connecting rod and engine block.

Gu Yingkui, Zhou Zhibo. [3] have been discussed a three-Dimensional model of a diesel engine crankshaft were established by using PRO/E software and analytical ANSYS Software tool, it shows that the high stress region mainly concentrates in the knuckles of the crank arm & the main journal and the crank arm & connecting rod journal ,which is the area most easily broken.

Abhishekchoubey, and Jamin Brahmbhatt.[4] have been analyzed crankshaft model and 3-dimentional model of the crankshaft were created by SOLID WORKS Software and imported to ANSYS software. The crankshaft maximum deformation appears at the centre of crankpin neck surface. The maximum stress appears at the fillets between the crankshaft journals and crank cheeks and near the central point journal. The edge of main journal is high stress area.

R. J. Deshbhratar, and Y.R Suple.[5] have been analyzed 4- cylinder crankshaft and model of the crankshaft were created by Pro/E Software and then imported to ANSYS software The maximum deformation appears at the centre of crankshaft surface. The maximum stress appears at the fillets between the crankshaft journal and crank cheeks, and near the central point. The edge of main journal is high stress area. The crankshaft deformation was mainly bending deformation under the lower frequency. And the maximum deformation was located at the link between main bearing journal and crankpin and crank cheeks. So this area prones to appear the bending fatigue crack.

III. OBJECTIVE:

An attempt in this paper, the crankshaft is modelled by using CATIA-V5 software, and static analysis is done by using ANSYS Workbench software. To evaluate the von-misses stress and shear stress.

IV. MATHEMATICAL MODEL FOR CRANKSHAFT:

Configuration of the Engine to which the crankshaft belongs, Fazin H. Montazersadgh and Ali Fatemi [6].

Crank pin radius	22.6
Shaft Diameter	34.925
Thickness of the Crank web	21.336
Bore diameter	53.73
Length of the crank pin	43.6
Maximum pressure	35bar

Force on the piston:

Bore diameter (D) =53.73mm, F_Q= Area of the bore ×Max. Combustion pressure

$$= \frac{\pi}{4}\times D^2 \times P_{max} = 7.93KN$$

In order to find the Thrust Force acting on the connecting rod (F_Q), and the angle of inclination of the connecting rod with the line of stroke (i.e. angle Ø).

$$sin\phi = \frac{sin\theta}{L/R} = \frac{sin\ 35^0}{4}$$

Which implies $\emptyset = 8.24^0$

We know that thrust Force in the connecting rod, $F_Q = F_P/cos\emptyset$

From we have

Thrust on the connecting rod, F_Q =8.01KN

Thrust on the crankshaft can be split into tangential component and radial component.

1. Tangential force on the crankshaft,

$F_T = F_Q \sin(\theta + \emptyset) = 5.48KN$

2 .Radial force on the crankshaft,

$F_R = F_Q \cos(\theta + \emptyset) = 5.83KN$

Reactions at bearings (1&2) due to tangential force is given by

$H_{T1} = H_{T2} = F_T/2$

Similarly, reactions at bearings (1&2) due to radial force is given by
$H_{R1} = H_{R2} = F_R/2$

4.1 Design of crankpin:
Let d= diameter of crankpin in mm
We know that bending moment at the centre of the crankshaft
$M_C = H_{R1} \times b_2 = 156.62$KN-mm
Twisting moment on the crankpin
$(T_C) = 61.94$KN-mm
From this we have equivalent twisting moment
$T_e = \sqrt{Mc^2 + Tc^2} = 168.42$KN-mm

Von-misses stress induced in the crankpin

$M_{ev} = \sqrt{(Kb + Mc)2 + \frac{3}{4}(Kt \times Tc)2}$

$= 177.860$KN-mm

$M_{ev} = \frac{\pi}{32} \times d^3 c \times \sigma v$

$\sigma_v = 19.6$N/mm²

Shear stress:

$\tau_e = \frac{\pi}{16} d^3 c \times \tau$

$\tau = 9.28$N/mm²

V. MODELING AND MESHING OF THE CRANKSHAFT:

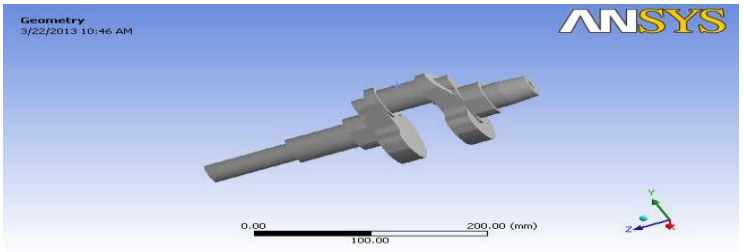

Figure :- 5.1. Model of the crankshaft

Mesh Statics:
Type of Element : Tetrahedrons
Number of nodes : 4873
Number of Elements: 2490

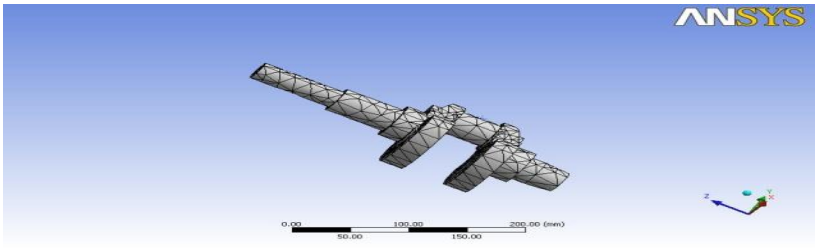

Figure :- 5.2 Meshed model of the crankshaft

VI. ANALYSIS:

Introduction to FEA:

The basis of FEA relies on the decomposition of the domain into a finite number of sub-domains (elements) for which the systematic approximate solution is constructed by applying the variational or weighted residual methods. In effect, FEA reduces problem to that of a finite number of unknowns by dividing the domain into elements and by expressing the unknown field variable in terms of the assumed approximating functions within each element. These functions (also called interpolation functions) are defined in terms of the values of the field variables at specific points, referred to as nodes. The finite element method is a numerical procedure that can be used to obtain solutions to a large class of engineering problems involving stress analysis, heat transfer, electro-magnetism, and fluid flow.

Introduction to ANSYS Software:

ANSYS is general-purpose Finite Element Analysis (FEA) software package. Finite Element Analysis is a numerical method of deconstructing a complex system into very small pieces (of user designed size) called elements. The software implements equations that govern the behaviour of these elements and solves them all; creating a comprehensive explanation of how the system acts as a whole.

The ANSYS Workbench environment is an intuitive up-front finite element analysis tool that is used in conjunction with CAD systems and/or Design Model. ANSYS Workbench is a software environment for performing structural, thermal, and electromagnetic analyses. The Workbench focuses on attaching existing geometry, setting up the finite element model, solving, and reviewing results.

Static Analysis:

Used to determine displacements, Stresses, Strain, Deformation etc. under static loading conditions in both linear and nonlinear static analysis. Nonlinearities include plasticity, stress stiffening, large deflection, large strain, hyper elasticity, contact surfaces, and creep.

Apply Material for crankshaft (cast iron).

Material Type: cast iron
Young modulus: 1.78e+005Mpa
Poisson's ratio: 0.3
Density: 7.197e-006kg/mm³

VII. RESULTS AND DISCUSSION:

Analysis of crankshaft-cast Iron

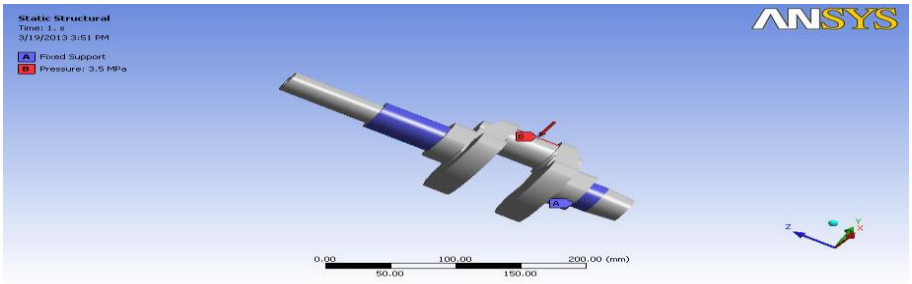

Figure:- 7.1 Apply Boundary conditioon the crankshaft

The two ends of the crankshaft is To be fixed, the load 3.5 Mpa is applied on the top of the crankpin surface.

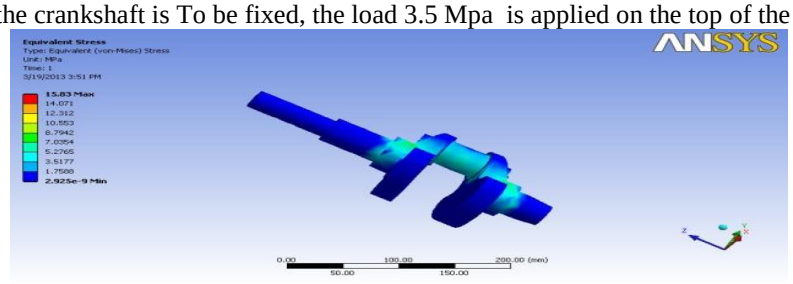

Figure:- 7.2 crankshaft voin-misses stress

The maximum stress induced in the crankshaft is 15.83 Mpa at the crankpin neck surface. Minimum stress 2.925e-9 Mpa.

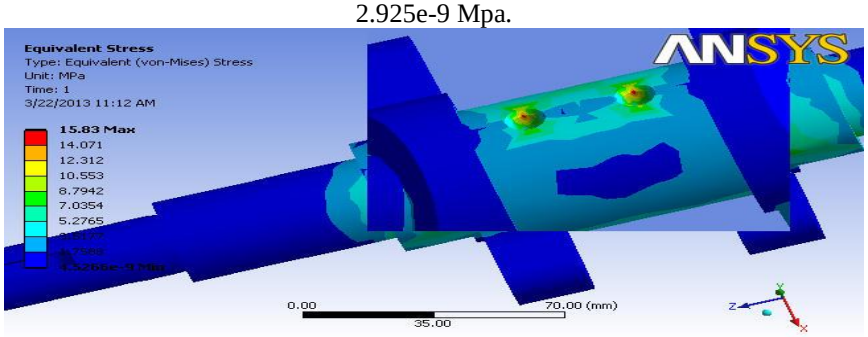

Figure:- 7.3 Maximum stress induced in the crankpin area

Maximum stress induced in the Crankshaft is 15.83Mpa at the fillet areas.

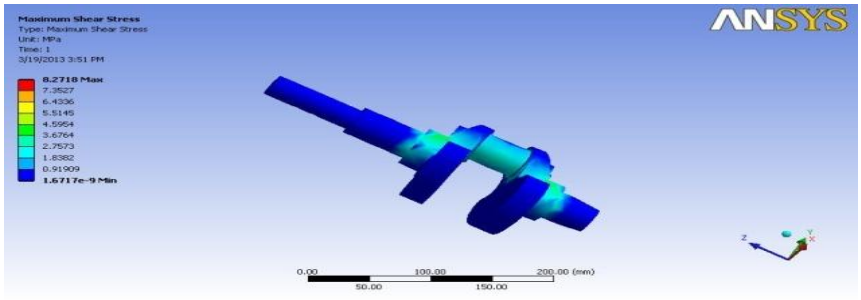

Figure:-7.4 crankshaft shear stress

The Maximum shear stress induced in the crankshaft is 8.2718Mpa, Minimum stress induced is1.6717e-91Mpa.

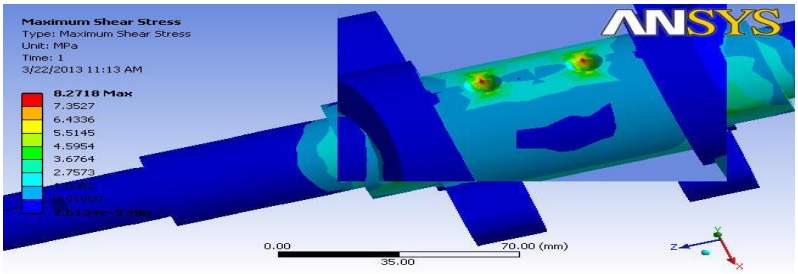

Figure:- 7.5 Maximum shear stress in the crankshaft.

The Maximum shear stress is 8.271Mpa at the crankpin area.

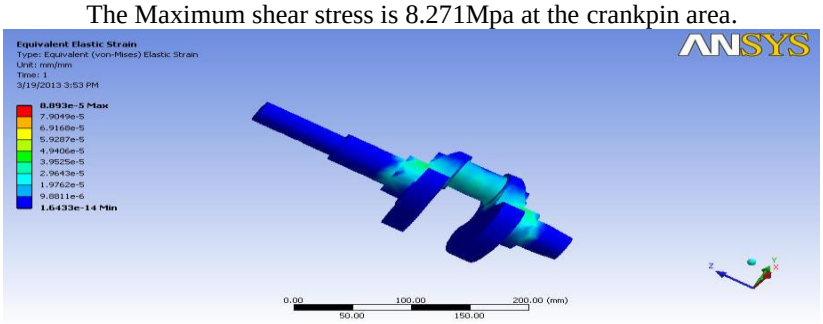

Figure:- 7.6 crankshaft(cast Iron) elastic strain Maximum Strain in the crankshaft is 8.893e-5.

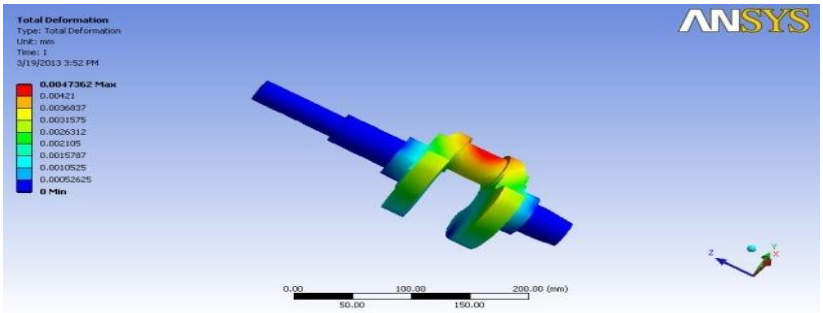

Figure:- 7.7 crankshaft total deformation

VIII. CONCLUSION:-

Validated Results:-

S.No	Type of stress	Theoretical	ANSYS results
1	Von-misses stress(N/mm^2)	19.6	15.83
2	Shear stresses (N/mm^2)	9.28	8.271

- The maximum deformation appears at the centre of the crankpin neck surface.
- The maximum stress appears at the fillet areas between the crankshaft journal and crank cheeks and near the central point journal.
- The value of von-misses stresses that comes out from the analysis is far less than material yield stress so our design is safe.

REFERENCES:

[1.] Rincle Garg, Sunil Baghla, "Finite element analysis and optimization of crankshaft", International Journal of Engineering and Management Reaserch, vol-2,Issue-6,ISSN: 2250-0758, Pages:26-31, December 2012.

[2.] C.M Balamurugan, R. Krishnaraj, Dr.M.sakhivel, K.kanthavel, Deepan Marudachalam M.G, R.Palani, "Computer Aided modelling and optimization of Crankshaft", International Journal of scientific and Engineering Reaserach, Vol-2, issue-8, ISSN:2229-5518, August-2011.

[3.] Gu Yingkui, Zhou Zhibo, "Strength Analysis of Diesel Engine Crankshaft Based on PRO/E and ANSYS", Third International Conference on Measuring Technology and Mechatronics Automation, 2011.

[4.] Abhishek choubey, Jamin Brahmbhatt, "Design and Analysis of Crankshaft for single cylinder 4-stroke engine", International Journal of Advanced Engineering Reaserch and studies, vol-1, issue-4, ISSN:2249-8974, pages: 88-90, July-sept 2012.

[5.] R.J Deshbhratar, Y.R Suple, " Analysis and optimization of Crankshaft using FEM", International Journal of Modern Engineering Reasearch, vol-2, issue-5, ISSN:2249-6645, pages:3086-3088, Sept-Oct 2012.

[6.] Farzin H. Montazersadgh and Ali Fatemi " Stress Analysis and Optimization of Crankshafts Subjected to Dynamic Loading", AISI, August 2007.

Efficient Model for OFDM based IEEE 802.11 Receiver with Autocorrelation technique And CORDIC algorithm

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ABSTRACT:
To achieve compact spectral utilization with utmost efficiency in OFDM based WLAN receiver, Autocorrelator and CORDIC algorithm is used. This paper deals with simulation of these algorithms using Verilog HDL. An Autocorrelator takes care of frame synchronization, time synchronization, frequency synchronization by autocorrelating the received signal. CORDIC is an iterative trigonometric algorithm that performs vector rotations with one additional bit of accuracy for each iteration. It is used to estimate frequency offset by calculating the phase of the maximum correlating signal.

Keywords *- Autocorrelator, CORDIC, frequency offset, Iteration, Synchronization.*

I. INTRODUCTION

During recent years the need for mobile broadband communications has increased rapidly placing new demands for the wireless local area networks (WLANs). To answer these needs, the European Telecommunications Standards Institute (ETSI) is working on HIPERLAN (HIgh PERformance LAN) standards. The HIPERLAN/2 architecture is easily adapted and integrated with a variety of fixed networks. It has a very high transmission rate up to 54 Mbit/s in 5GHz band. This is achieved by making use of a modularization method called Orthogonal Frequency Digital Multiplexing (OFDM) [1]. The basic idea of OFDM is to transmit broadband, high data rate information by dividing the data into several interleaved, parallel bit streams, and let each bit stream modulate a separate subcarrier [1].

The property of orthogonality allows simultaneous transmission on a lot of sub-carriers in a tight frequency space without interference from each other. This acts as an advantage in OFDM [3][4][5].Therefore, OFDM is becoming the chosen modulation technique for wireless communication. OFDM is particularly efficient in time-dispersive environments. With the help of OFDM, sufficient robustness can be achieved to provide large data rates to radio channel impairments. OFDM requires extensive use of Autocorrelator and CORDIC. In this paper we will give the implementation details needed by the Hiperlan 2 standard, but most of the work can be generalized to the IEEE standards since physical layer in both three standards are similar (a common synchronization solution is found in [2]).

The paper is organized as follows. In section II we describe the WLAN Receiver structure and its modulation technique is discussed. In section III and IV we discuss about Autocorrelator and CORDIC blocks respectively. The simulation results of these blocks are discussed in section V. Finally conclusions are drawn in section VI.

II. WLAN RECEIVER MODEL

2.1. Modulation Scheme

A combination of modulation and multiplexing constitutes the orthogonal frequency division multiplexing, in other words OFDM. Modulation is the process of transforming the carrier into waveforms suitable for transmission across channel, according to parameters of modulated signal [6]. A key feature of the physical layer is to provide several physical layer modes with different coding and modulation schemes, which are selected by link adaptation. BPSK, QPSK and QAM are the supported subcarrier modulation schemes. The most useful type of modulation for OFDM (orthogonal frequency division multiplexing) is Quadrature amplitude modulation (QAM). QAM changes phase and amplitude of the carrier, and it is a combination of amplitude shift keying (ASK) and phase shift keying (PSK).

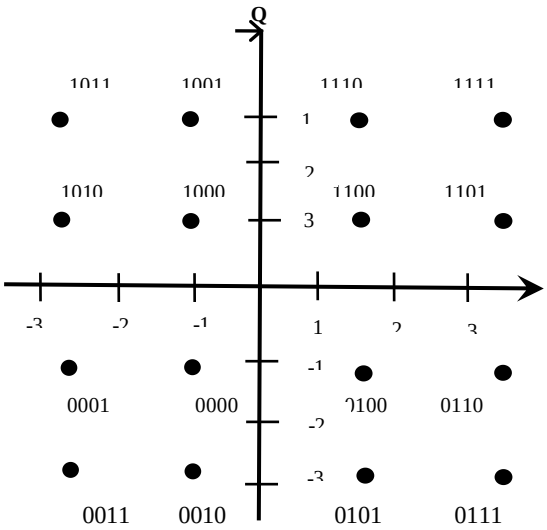

Figure 1. QAM Constellation

2.2 WLAN Receiver structure

Fig 2 shows the block diagram of the WLAN transceiver. The IF-stage has been designed to upconvert the transmitted signal at a frequency of 20 MHz, and to downconvert from a frequency of 45 MHz. In WLAN standards the base band OFDM signal is built using a 64-point IFFT.

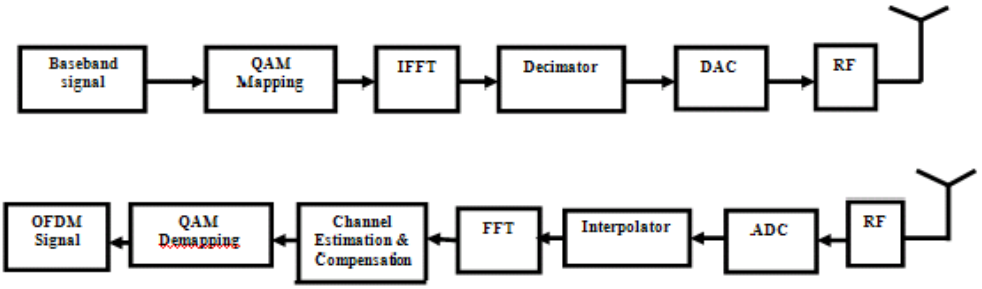

Figure 2. WLAN Transceiver

After down-conversion the following stages are applied to the base-band signal (see Figure 2): timing synchronization, coarse and fine carrier frequency offset (CFO) estimation and correction, FFT-based OFDM demodulation, channel estimation and compensation.

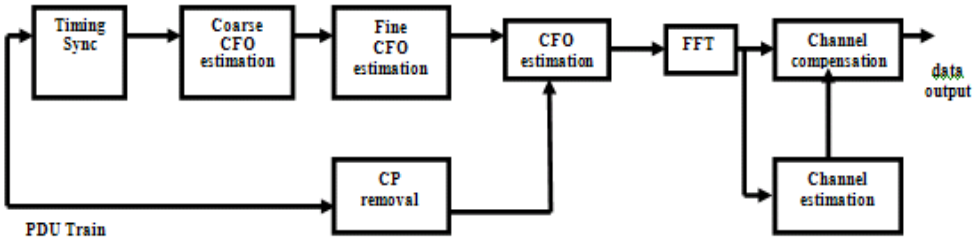

Figure 3. Receiver Structure

In WLAN systems, synchronization and channel compensation is done by using a preamble. So, in Hiperlan/2 the access point transmits a broadcast preamble that is used by mobile terminals (MT) to perform synchronization for both time, frame and frequency, automatic gain control (AGC), and channel estimation. Therefore, the synchronization phase in an MT can be divided in three parts: broadcast preamble detection; time synchronization, that consists of estimating the sample when the OFDM symbol starts and carrier frequency offset (CFO) estimation.

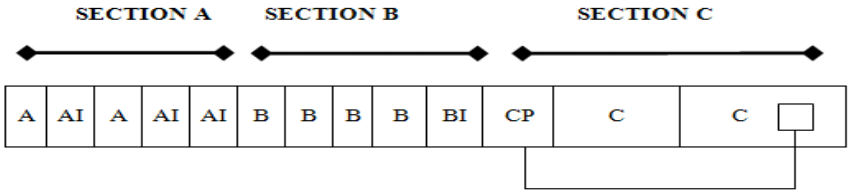

Figure 4. Preamble Structure

In this preamble ,section A is used for AGC and frame detection, section B is intended for time synchronization and coarse CFO estimation and section C can be used for fine CFO estimation and channel estimation.

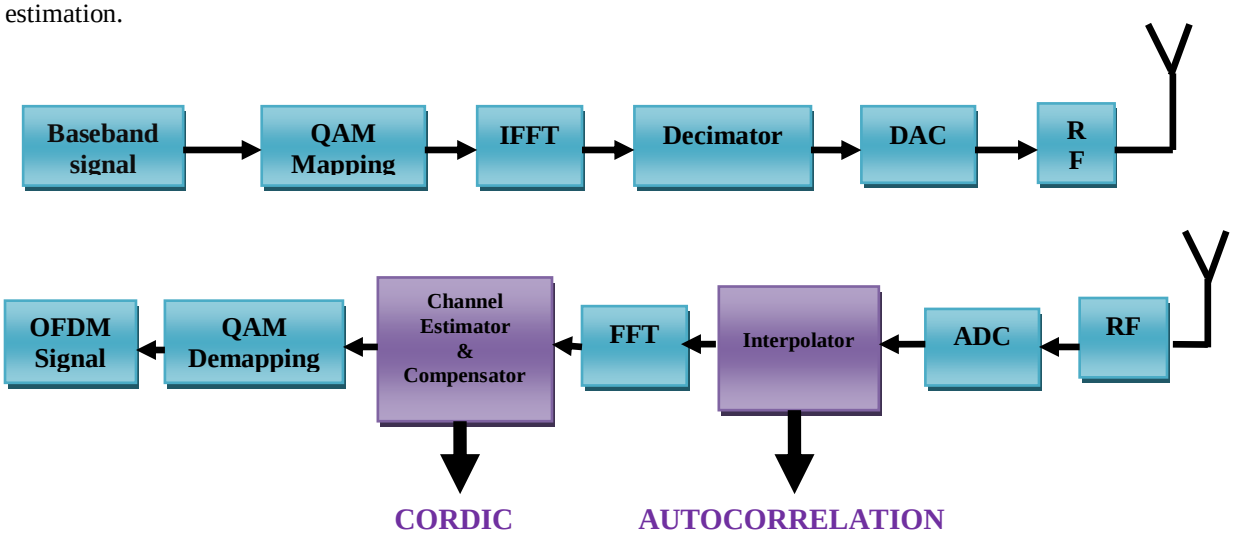

Figure 5. Block diagram of the proposed model

III. AUTOCORRELATION

Autocorrelation is a measure of how well a signal matches a time shifted version of itself, as a function of the amount of time shift. Autocorrelation of a random signal is also be described as correlation between values of the same signal at different points in time. Therefore, autocorrelation can be used to distinguish repeating patterns in signals. A quite basic application of autocorrelation is determining tempo for musical beat or pitch detection. It is a measure of similarity between a data set and a shifted copy of the data as a function of shift magnitude**.** Correlation analysis is used to find periodic patterns in noisy data, characterize similarity patterns in data compression, and measurement of spatial resolution of an image receptor with uniform white noise as the input. For medical imaging a major use of autocorrelation is for the measurement of film and screen spatial resolution[7].

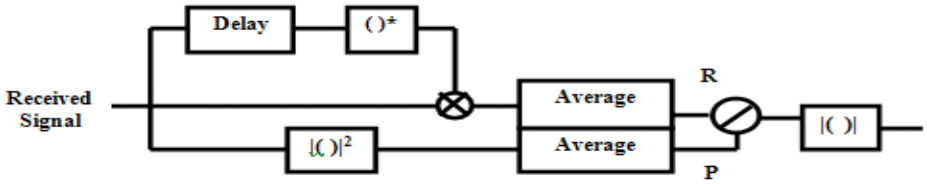

Figure 6. Block diagram of Autocorrelator

The autocorrelation function will be designated as Cx(Δ),

where $Cx(\Delta) = E\{I(x)\, I(x+\Delta)\}$ (1)

This equation tells that the autocorrelation of the any signal is the expected value of product of the same signal with delayed version of itself.

3.1 Autocorrelation based detection

Detection is based on the value of the autocorrelation coefficient of the received signal. In this detection method, the system is identified by the time delay value (Td), which should provide a nonzero autocorrelation value, if the received signal is from a particular radio system and about 0, if the received signal is noise. The decision making is based on the knowledge of statistical distribution of the autocorrelation coefficient. Once the value of the autocorrelation coefficient is computed, the decision can be performed so that a predefined false alarm rate specification of detection is fulfilled.

Autocorrelation-based detection can effectively detect PU signals under the noise floor, and is able to identify specific OFDM-based signaling systems. The implementation is relatively simple, since no FFT is done to the input signal. This limits the detection to the baseband frequency, but resource gain from omitting a FFT is significant for a low power implementation.

IV. CORDIC (COORDINATE ROTATION DIGITAL COMPUTER)

The CORDIC means Coordinate Rotation Digital Computer algorithm was developed in 1959. It rotates the vector, step by step, with a given angle. Additional theoretical work has been done in 1971. The main principle of CORDIC are calculations based on shift registers and adders instead of multiplications, what saves much hardware resources.It is used for polar to rectangular and rectangular to polar conversions and also for calculation of trigonometric functions, vector magnitude and in some transformations, like discrete Fourier transform (DFT) or discrete cosine transform (DCT).

The CORDIC is hardware efficient algorithms for computation of trigonometric and other elementary functions that use only shift and add to perform. The CORDIC set of algorithms for the computation of trigonometric functions was designed by Jack E.Volder in 1959 to help building a real time navigational system for the B-58 bomber. Later, J. Walther in 1971 extended the CORDIC scheme to other functions. The CORDIC method of functional computation is used by most calculators (such as the ones by Texas Instruments and HP) to approximate the normal transcendental functions.

Depending on the configuration, the resulting module implements pipelined, parallel pipelined, word serial, or bit-serial architecture in one of two modes, rotation or vectoring. In rotation mode, the CORDIC rotates a vector by a certain angle. This mode is used to convert polar to Cartesian coordinates. For example consider the multiplication of two complex numbers x+jy and (cos(θ) +jsin(θ)). The result u+jv , can be obtained by calculating the final coordinate after rotating a 2x2 vector $[x\ y]^T$ through an angle (θ) and then scaled by a factor r. This is achieved in CORDIC via a three-stair procedure such as angle conversion, vector rotation and scaling.

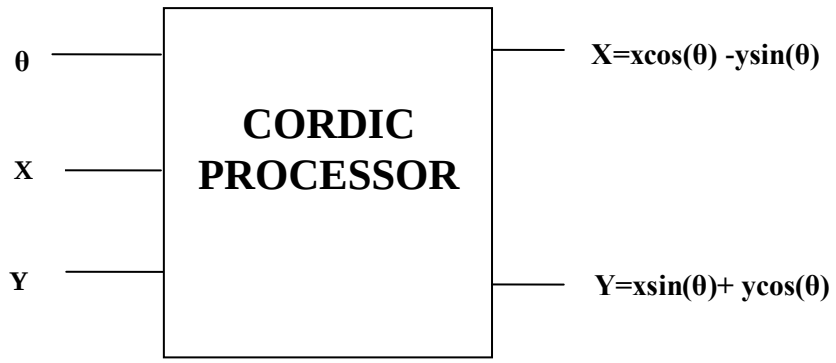

Figure 7. Block diagram of CORDIC Processor

The circular cordic rotation is shown in fig 7.

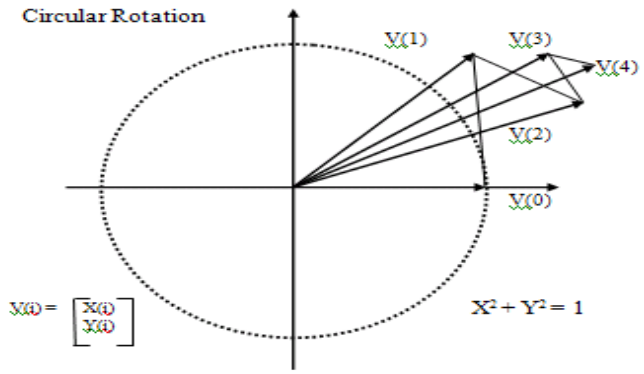

Figure 8. Circular CORDIC rotation

CORDIC is based on the common rotation equations.The vector rotation is given as

$x' = x\cos(\varphi) - y\sin(\varphi)$ (2)

$y' = y\cos(\varphi) + x\sin(\varphi)$ (3)

$x' = \cos(\varphi)[x - y\tan(\varphi)]$ (4)

$y' = \cos(\varphi)[y + x\tan(\varphi)]$ (5)

$x_{i+1} = \cos(\tan^{-1}(\pm 2^{-i}))\cdot[x_i - y_i \cdot d_i \cdot 2^{-i}]$ (6)

$y_{i+1} = \cos(\tan^{-1}(\pm 2^{-i}))\cdot[y_i + x_i \cdot d_i . 2^{-i}]$ (7)

$x_{i+1} = K_i \cdot [x_i - y_i \cdot d_i \cdot 2^{-i}]$ (8)

$y_{i+1} = K_i \cdot [y_i + x_i \cdot d_i \cdot 2^{-I}]$ (9)

$z_{i+1} = z_i - d_i \cdot \arctan(2^{-i})$ (10)

where $K_i = \cos(\tan^{-1} 2.\exp(-i)) = 0.60725$ and $d_i = \pm 1$

So to reach an expected angle, a series of iterations are required to be performed and in this design the number of iterations are 8 and in every iteration the new values of x, y and z depend upon the previous values of the same.

According to [8] [9], the CORDIC processor can be configured to work as circular, hyperbolic and linear rotations for both vectoring and rotational modes. The circular vectoring mode is used to calculate coarse Carrier Frequency Offset (CFO) estimation and fine CFO estimation. The circular rotation mode is used to correct coarse CFO of the broadcast preamble, and to correct received section C and received OFDM symbols. The linear vectoring mode is used to calculate the division in the channel estimation stage.

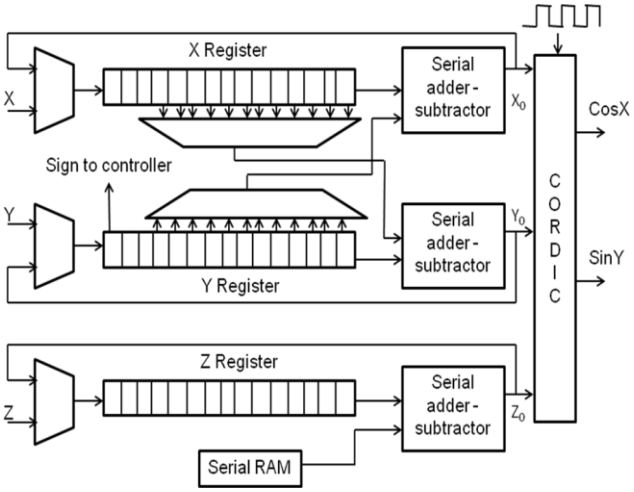

Figure 9. Operation of CORDIC Algorithm

V. SIMULATION RESULTS OF THE PROPOSED MODELS

The proposed model of both Autocorrelator and CORDIC algorithm have been coded in Verilog HDL, synthesized using Xilinx ISE 9.2i which also specifies the number of hardware required. Table *I* shows the hardware usage of the Autocorrelator.

5.1 Results of Autocorrelator block

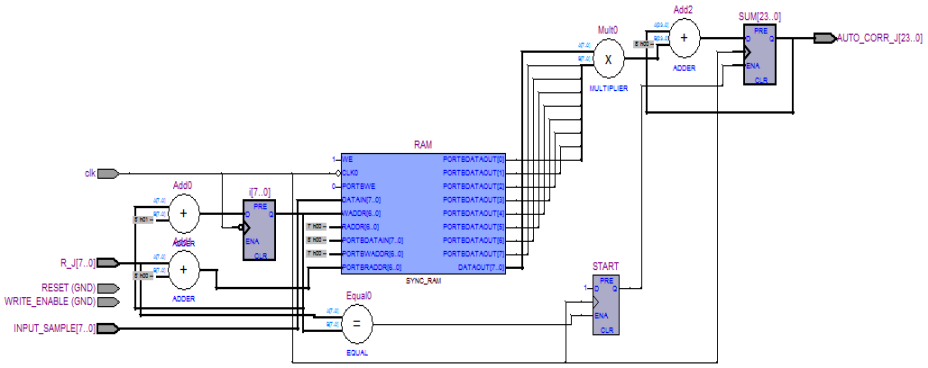

Figure 10. RTL Schematic of Autocorrelator

The RTL schematic of proposed autocorrelator block is shown in fig 9. The proposed autocorrelator block is designed using various units like Adders, Subtractors, RAM, Flipflops, Multipliers. The main aim of autocorrelator block is done by the adder and subtractor unit. Adder and subtractor unit takes care of correlation process. RAM is used for storage purpose. It is used for storing both input sample and the delayed version of itself.

TABLE I: HARDWARE USAGE OF AUTOCORRELATOR

LOGIC UNIT	NUMBER REQUIRED
RAM	**2**
Multiplier	**1**
Adder/Subtractor	**2**
Counter	**2**
Accumulator	**1**
Register	**2**
Comparator	**1**

The maximum period and the maximum frequency of the proposed design is **21.792 ns** and **45.888 MHz.** The delay which is obtained in the proposed model is **10.896 ns** and also the offset of the model is **15.492 ns.**

TABLE II: RESOURCE USAGE OF AUTOCORRELATOR

LOGIC ELEMENTS	UTILISED	AVAILABLE
Number of slice flipflops	**64**	**1920**
Number of 4 input LUTs	**366**	**1920**
Number of occupied slices	**210**	**960**
Total number of 4 input LUTs	**387**	**1920**
Number of bonded IOBs	**43**	**66**
Number of BUFGMUXs	**1**	**24**
Number of multiplier	**1**	**4**
Average fanouts of nonclock nets	**5.43**	**-**

5.2 Results of CORDIC Algorithm

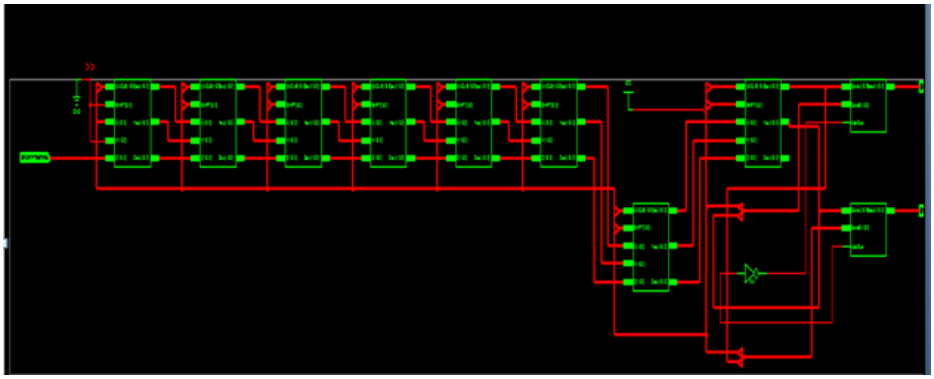

Figure 11. RTL schematic of CORDIC Algorithm

The fig 10 shows the RTL Schematic of CORDIC Algorithm. This model consists of **eight iterator blocks, adders/subtractors, comparators, multipliers and logic shifters**. Each iterator block sequentially provides the output. The output of previous iterator block is taken as the input of next iterator block and process goes on sequentially like this upto eight iterations.

TABLE III: HARDWARE USAGE OF AUTOCORRELATOR

HARDWARE	NUMBER REQUIRED
Multiplier	**4**
Adder/Subtractor	**32**
Comparators	**52**
Logic shifters	**40**
IO buffer	**48**
IBUF	**16**
OBUF	**32**
IOs	**49**

The delay for the proposed CORDIC Algorithm is **66.321ns**. The total memory usage which obtained in this model is **297012Kilo bytes.** The total real time to Xst completion is **31s.** The total CPU time to Xst completion is **31.24 s.**

TABLE IV: RESOURCE USAGE OF CORDIC ALGORITHM

LOGIC ELEMENTS	USED	AVAILABLE
Number of slice flipflops	**542**	**960**
Number of 4 input LUTs	**1031**	**1920**
Number of bonded IOBs	**48**	**66**
Number of multiplier	**4**	**4**

VI. CONCLUSION

The Proposed model concludes that the performance of the WLAN receiver has been enhanced by means of Autocorrelator and CORDIC Algorithm.

Autocorrelator can perform synchronization for frame ,time and frequency. It has been also proved that Autocorrelation is suitable for synchronization. After a careful analysis of competing algorithms, it is decided that the best choice for time synchronization is to use the basic Auto-Correlation estimator. To get more accuracy for estimating the frequency offsets, CORDIC algorithm is used**.** It is used for estimating the carrier frequency offsets as well as compensating those frequencies by estimating the phase of the maximum correlating signal. It is more advantageous to greatly reduces the delay while using the multiplier hardware. In previous methods for estimating the offsets, eventhough it achieves better result it lack accuracy. But in the proposed model, the given sample is serially iterated in order to achieve the bit of accuracy. It also achieves minimum resource utilization.The proposed model also proved that the utility of devices is lesser than the other existing model. In the end, the proposed design consumed an relatively low quantity of hardware resources, gives less delay and produced excellent results for packet detection, frequency offset estimation, and time, frequency synchronization.

VII. FUTURE WORK

By getting the better results, it is also decided that the quantized 64 sample cross correlator, in conjunction with the maximum detector, it would be used for fine time synchronization. On analysis, it is obtained that the fast pipelined CORDIC architecture drastically increases area and power by increasing number of iterations and number of cells usage. Thus the algorithm is greatly enhanced in future use. This design can also be implemented in FPGA or ASIC to achieve the spectral efficiency in OFDM WLAN reciever. The minimization of the power difference or maximizing the SINR approaches could be considered to optimize the compensation process such that the system performance is improved. From the architectural point of view where the iterative process adds more challenge to the design of the synchronization unit. Furthermore, the timing and frequency synchronization architecture unit could be evaluated in a testbed OFDM system.

REFERENCES

[1] Johnsson, M. HIPERLAN/2 -- The Broadband Radio Transmission Technology Operating in the 5 GHz Frequency Band, 14.9.1999 [referenced 1.11.1999]

[2] M.J. Canet, F. Vicedo, V. Almenar, J. Valls, E.R. de Lima,"A common FPGA-basedsynchronizerarchitecture for Hiperlan/2 and 802.11a WLAN systems". PIMRC 2004, Barcelona, Spain, 2004.

[3] David Gesbert, Mansoor Shafi, Dashan Shiv, Peter J Smith, and Aymon Naguib, "From Theory to Practice: An Overview of MIMO Space-Time coded Wireless Systems", IEEE Journal on selected areas in Communications,Vol.21,No.3,Aprial 2003.

[4] Siavash M.Alamouti, "A Simple Transmit diversityTechnique for Wire less Communications",IEEE Journal on selected areas in Communications, Vol.16, No.8, October 1998.

[5] Kaiser, Wilzeck, Berentsen and Rupp , "Prototyping for MIMO Systems: An Overview" ,International Conference EUSIPCO, Austria, pp.681-688, Sept 6-10, 2004.

[6] Terry J., Heiskala J.: "OFDM Wireless LANs: A Theoretical and Practical Guide", Indianapolis, Ind.: Sams, 2002.

[7] JohnG. Proakis and Dimities G. Manolakis, Digital Signal Processing Principles, Algorithms and Applications", Prentice-Hall India Publications, Third Edition, ISBN -81-203-1129-9.

[8] Meyer-Baese.U, "Digital Signal Processing with Field Programmable Gate Arrays",Springer- Verlag, ISBN 81-8128-045-8, 2003.

[9] Sudhakar Reddy .P and Ramachandra Reddy.G, "Design and Implementation of Autocorrelator and CORDIC Algorithm for OFDM based WLAN", European Journal of Scientific Research, UK, Vol.25, No.2, Nov, 2008.

[10] Jose.M Canet, Felip Vicedo, Vicenc Almenar, Javier Valls, "FPGA Implementation of an IF transceiver for OFDM-based WLAN", IEEE Workshop on Signal Processing Systems, Vol.2,pp. 227-232, October, 2004.

[11] AlmenarV, Abedi S and Rahim Tafazolli, "Synchronization Techniques for HIPERLAN/2", 54th IEEE Vehicular Technology Conference, Vol. 2, pp. 762-766, 2001(Fall).

[12] Jack Volder, "The CORDIC Trigonometric Computing Technique", IRE Transactions on Electronic Computing, Vol EC-8, pp.330-334, September 1959.

[13] Ray Andraka, "A survey of CORDIC algorithms for FPGA based computers", ACM 0-89791-978-5/98/01, 1998.

[14] AL-Dweik, A. Hazmi, S. Younis, B. S. Sharif, and C. C. Tsimenidis, "Iterative frequency offset estimator for OFDM systems," IET Com., vol. 4, p. 2008 2019, 2010.

[15] I. Tolochko& M. Faulkner, "Real Time LMMSE Channel Estimation for Wireless OFDM Systems with Transmitter Diversity," in proc. IEEE 56th VTC, vol. 3, Fall 2002, pp. 1555– 1559.

Traditional Uses Of Plants By The Tribal Communities Of Salugu Panchayati Of Paderu Mandalam, Visakhapatnam, District, Andhra Pradesh, India.

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***ABSTRACT*:**

An ethnomedicinal survey was carried out in Parvathipuram, Agency, Vizianagaram District, and Andhra Pradesh, India. For documentation of important plants and information from local community about their medicinal uses. The indigenous knowledge of local traditional uses was collected through questionnaire and personal interviews during field trips. The identification and nomenclature of the listed plants were based on The Flora of Andhra Pradesh. A total of 95 plants species were identified by taxonomic description and locally by ethnomedicinal knowledge of people existing in the region. Plant specimens collected, identified, preserved and mounted were deposited in the department of botany, Andhra University, Visakhapatnam for future references.

Key Words: *Traditional uses, tribal communities, ethnomedicinal plants, salugu panchayati, paderu Mandalam, Visakhapatnam district.*

I. INTRODUCTION

The Indian sub-continent is unique in the richness of plant wealth. In India, 15,000 higher plant species occur, of which 9,000 wild plants used by the tribals, for their requirements. Out of the 7,500 wild plants used for medicinal purposes by the tribals, about 950 species found to be new claims and worthy for the scientific investigation. Many wild plants are used as edibles by the tribals. Almost all the plants are used -as cordage, pesticides, fodder, fibre and gum.

Recent investigators showed interest on investigating about medicinal plants and collection of folklore claims. Many traditional medical systems are mainly using the herbs. Many scientists of different disciplines have paid good attention in screening the medicinal plants used in different traditional systems. So the scientists have succeeded in exploring good number of heeling agents.

Rao (1958) made observations on the vegetation of the Rampa and Gudem agency tracts of Eastern Ghats. Pal and Banerjee (1971) reported less-known plant foods among the tribals of Andhra Pradesh and Orissa. Nisteswar and Kumar (1980) emphasized utilitarian values of medical-folklore of Rampa agency. Nisteswar and Kumar (1983) recorded folklore medicine of Addateegala agency tracts of East Godavari district. Rama Rao and Henry (1996) reported the ethnomedicinal practices of tribal communities in Srikakulam district.

An important prerequisite for proper utilization of raw materials of the country is the survey of its natural resources and the preparation of an inventory. It is necessary that we should have full knowledge regarding the occurrence, frequency, distribution and phenology of various plants for their proper utilization. The forests of Andhra Pradesh have great potentiality both from the economic and botanical points of view. The State is one of the timber and non-timber rich forests in India.

II. STUDY AREA

Salugu Panchayat is an interior pocket of the Paderu Mandal. The altitude in this region ranges from 600 to 900 m. The panchayat consists of 24 villages and hamlets belonging to different tribal groups like the Bagata, Valmiki, Nookadoras, Kondadoras, Konda Kammaras and Khonds. The total population of the panchayat is 2,500. Apart from paddy, agriculture is primarily on dry land. Minor cereals, millets, pulses, red gram, and oilseeds like niger and castor, are the main cash crops. Shifting cultivation is widely practiced in this panchayat.

Collection of NWFPs (Non-timber wild forest products) is widespread in the villages of Salugu Panchayat. The area has rich natural forests consisting of mango, tamarind, jack, custard *(Annona squamosa)*, lemon, cleaning nut or induga *(Strychnos potatorum)*, karaka, kanuga, gum karaya *(Sterculia urens)*, adda leaves for plate making, rosewood *(Dalbergia latifolia)* and bamboo. Tamarind is collected by men and women. On average a family earns Rs. 200 to 600 (US$ 6 to 18) per tamarind tree. In this area, tribals collect NWFPs nine months out of the year. Women collect adda leaves and may spend 7 hours a day collecting the leaves when they are in season. These leaves are dried for 2 days, packed into 50 kg shoulder loads for men and 30 kg for women to be carried to the weekly market. A shoulder load of leaves fetches anywhere between Rs. 50 (US$ 1.50) and Rs. 120 (US$ 3.60) depending on the season and quality of the leaves. Each tribal household requires 20 to 25 headloads of firewood for cooking and keeping themselves warm in the winter. While women gather fallen branches and twigs, men cut trees for firewood. Cattle are taken up to 5 to 6 km into the forest for grazing. Children and women graze the cattle 20 days per month and the men take the cattle out the remaining 10 days. It is not uncommon for women and children to collect NWFPs while they are out with the cattle in the forest.

III. MATERIAL AND METHODS

The field work in the Parvathipuram hill range of Visakhapatnam District was carried out during 2012-2013. The tribes namely, Sugali, Yerukala, Yanadi are living in the study area comprises 3.2 % of district population. There were 50 informants between the ages of 40 – 60. Emphasis was given to register ethnomedicinal knowledge possessed by tribal people especially the elders (above 50 of age). Local informants with the knowledge of medicinal plants were selected based on the experience in the preparation of medicines, the way they acquired knowledge on the medicinal plants and their ability to treat a specific disease. The ethnobotanical uses of plants were collected by using structured questionnaires. Ethnobotanical data were collected according to the methodology suggested by Jain (1991). The detailed information regarding herbal names, parts used, purpose, and medicinal uses were recorded in Table 1. The information thus collected was cross checked with the information from neighboring herbalists and also with the available literature (Madhusudan Rao, 1989). The methods of plant collection and preparations of herbarium have been followed by Jain and Rao (1997) and were identified taxonomically (Gamble and Fischer 1915-1936). The identified plant specimens were then confirmed by comparing with the types specimens in Madras herbarium (MH), Coimbatore, India. The voucher specimens were deposited in Andhra University herbarium, Visakhapatnam.

Table.1. Traditional uses of ethnomedicitional plants of Salugu Panchayati

S.No	Scientific name	Family	Vernacular name	Habit	Plant parts	Disease
1.	*Abelmoschus moschatus* Medik.	Malvaceae	Adavibenda	Herb	Seed	Fever
2.	*Abrus precatorius* Linn.	Fabaceae	Guriginja,	Straggler	Seed	Contraceptive
3.	*Acacia mangia* Willd	Mimosaceae	Acash	Tree	Stem bark	Paralysis
4.	*Acacia nilotica* (Linn.) Willd.	Mimosaceae	Nalla thumma	Tree	Stem bark	Diarrhoea
5.	*Acalypha indica* Linn.	Euphorbiaceae	Kuppinta	Herb	Leaf	Skin disease
6.	*Acanthospermum hispidum* DC.	Asteraceae	Pothoro konta	Herb	Leaves	wounds
7.	*Achyranthes aspera* Linn.	Amaranthaceae	Uthareni	Herb	Root	Jaundice
8.	*Acorus calamus* Linn.	Araceae	Vasa	Herb	Rhizome	Cough
9.	*Actinopteris radiata* (Swartz) Link.	Actinopteridaceae	Mayurasikha	Herb	Root	Snake bite
10.	*Adhatoda zeylanica* Medik.	Acanthaceae	Addasaram	Shrub	Leaf	Cough
11.	*Adiantum philippense* Linn.	Adiantaceae	Challi	Herb	Root	Cough
12.	*Aegle marmelos* (Linn.) Correa	Rutaceae	Maredu	Tree	Fruit	Dysentery
13.	*Ageratum conyzoides* Linn.	Asteraceae	Pumpullu	Herb	Leaves	Itching
14.	*Ailanthus excelsa* Roxb.	Simaroubaceae	Pedda manu	Tree	Stem bark	Cough
15.	*Alpinia galanga* (Linn.) Willd.	Zingiberaceae	Dumpa rashtramu	Herb	Tuber	Rheumatism
16.	*Basella rubra* Linn.	Basellaceae	Bacchali koora	Herb	Leaves	Piles
17.	*Bauhinia purpurea* Linn.	Caesalpiniaceae	Goddu koora	Tree	Bark	Leucorrhoea
18.	*Bauhinia vahlii* Wight & Arn.	Caesalpiniaceae	Adda chettu	Lian	Bark	Dysentery

19.	*Benincasa hispida* (Thunb.) Cogn.	Cucurbitaceae	Budida gummadi	Creeper	Fruit	Stomachache
20.	*Bidens pilosa* Linn.	Asteraceae	Rekkala raju	Herb	Leaves	Whitlow
21.	*Bixa orellana* Linn.	Bixaceae	Jaffra	Tree	Root	Fever
22.	*Boerhavia diffusa* Linn.	Nyctaginaceae	Atuka mamidi	Herb	Root	Jaundice
23.	*Bombax ceiba* Linn.	Bombacaceae	Buruga	Tree	Root	Fertility
24.	*Boswellia serrata* Roxb. ex Colebr.	Burseraceae	Induga,	Tree	Bark	Diarrhoea
25.	*Bridelia montana* (Roxb.) Willd.	Euphorbiaceae	Sankumanu	Tree	Bark	Jaundice
26.	*Butea monosperma* (Lam.) Taub.	Fabaceae	Moduga	Tree	Bark	Wounds
27.	*Caladium bicolor* Vent.	Araceae	Rudra chama	Herb	Tuber	Snake bite
28.	*Calycopteris floribunda* Lam.	Combretaceae	Adavijama	Shrub	Bark	Wounds
29.	*Canna indica* Linn.	Cannaceae	Metta thamara	Herb	Tuber	Ringworm
30.	*Canna edulis* Linn.	Cannaceae	Metta thamara	Herb	Tuber	Throat pain
31.	*Carica papaya* Linn.	Caricaceae	Boppayi	Tree	Fruit	Galactogauge
32.	*Cascabela thevetia* (Linn.) Lipp.	Apocynaceae	Paccha ganneru	Tree	Leaves	Skin disease
33.	*Cassia alata* Linn.	Caesalpiniaceae	Seema avisa	Shrub	Leaves	Eczema
34.	*Cassia auriculata* Linn.	Caesalpiniaceae	Thanthem	shrub	Leaves	Dysentery
35.	*Cassia fistula* Linn.	Caesalpiniaceae	Rela	Tree	Fruit	Jaundice
36.	*Ceiba pentandra* (Linn.) Gaertn.	Bombacaceae	Tella buruga	Tree	Bark	Skin disease
37.	*Celosia argentea* Linn. var. *plumose*	Amaranthaceae	Errakodijuttu	Herb	Leaves	Ulcers
38.	*Cipadessa baccifera* (Roth) Miq.	Meliaceae	Phaladonda	Shrub	leaves	Chikenpox
39.	*Cissampelos pareira* Linn.	Menispermaceae	Chiru boddhi	Climber	Root	Stomachache
40.	*Cissus quadrangularis* Linn.	Vitaceae	Nalleru	Climber	Stem	Paralysis
41.	*Coldenia procumbens* Linn.	Boraginaceae	Hamsa paadu	Herb	Leaves	Rhuematism
42.	*Corchorus olitorius* Linn.	Tiliaceae	Kranthi	Herb	Seed	Ear pain
43.	*Cordia dichotoma* Forst. *f.*	Boraginaceae	Banka nakkeri	Tree	Leaves	Jaundice
44.	*Costus speciosus* (Koen.) Sm.	Zingiberaceae	Bokacchika	Herb	Rhizome	Galactogogue
45.	*Crotalaria laburnifolia* Linn.	Fabaceae	Pedda giligicha	Shrub	Root	Snake bite
46.	*Crotalaria pallida* Dryd.	Fabaceae	Kandiri	Shrub	Seeds	Narcotics
47.	*Curculigo orchioides* Gaertn.	Hypoxidaceae	Nela tadi	Herb	Root	Headache
48.	*Curcuma aromatica* Sal.	Zingiberaceae	Kasthuri	Herb	Rhizome	Skin disease
49.	*Curcuma angustifolia* Roxb.	Zingiberaceae	Batripala	Herb	Rhizome	Galactogogue
50.	*Cuscuta reflexa* Roxb.	Cuscutaceae	Bangarutheeg	Herb	Plant	Piles
51.	*Datura innoxia* Mill.	Solanaceae	ummetha	Shrub	Leaf	Itching
52.	*Desmodium gangeticum* (Linn.) DC.	Fabaceae	Bhumi ippa	Shrub	Root	Rheumatism
53.	*Desmodium pulchellum* (Linn.) Benth.	Fabaceae	Kondaanteeth	Shrub	Leaves	Wounds
54.	*Diplocyclos palmatus* (Linn.) Jeffrey	Cucurbitaceae	Linga donda	Climber	Root	Tooth decay
55.	*Dillenia indica* Linn.	Dilleniaceae	Revadachettu	Tree	Bark	Stomachache

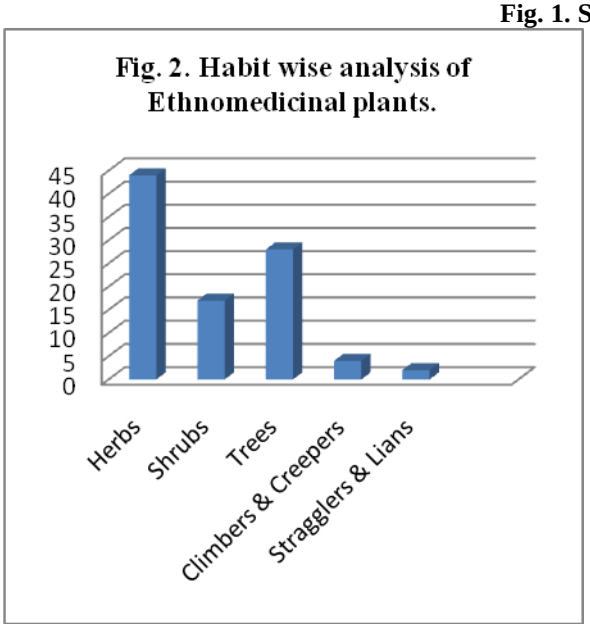
56.	*Dysophylla quadrifolia* Benth.	Lamiaceae	Rati thulasi	Herb	Leaves	Chickenpox
57.	*Elephantopus scaber* Linn.	Asteraceae	Eddu adugu	Herb	Root	Tooth decay
58.	*Elytraria acaulis* (Linn.*f*.) Lindau	Acanthaceae	Adavi diddica	Herb	Leaves	Ringworm
59.	*Emilia sonchifolia* (L.) DC.	Asteraceae	Garbapod	Herb	Tuber	Fits
60.	*Eryngium foetidum* Linn.	Apiaceae	Keralakotthimere	Herb	Root	Stomachache
61.	*Erythrina variegata* Linn.	Fabaceae	Badita	Tree	Bark	Backache
62.	*Euphorbia hirta* Linn.	Euphorbiaceae	Bottu mokka	Herb	Plant	Wounds
63.	*Euphorbia ligularia* Roxb.	Euphorbiaceae	Chettu jamudu	Tree	Latex	Backache
64.	*Euphorbia nivulia* Buch.-Ham.	Euphorbiaceae	Akujamudu	Tree	Latex	Cuts
65.	*Euphorbia tirucalli* Linn.	Euphorbiaceae	Kada jamudu	shrub	Latex	Galactogauge
66.	*Evolvulus alsinoides* Linn.	Convolvulaceae	Neelam puvvu	Herb	Plant	Asthma
67.	*Ficus benghalensis* Linn.	Moraceae	Marri	Tree	Leaf	Skin allergy
68.	*Ficus hispida* Linn. *f*.	Moraceae	Boddamarri	Tree	Leaf	Ringworm
69.	*Ficus microcarpa* Linn.*f*.	Moraceae	Juvvi	Tree	Bark	Dysentery
70.	*Gloriosa superba* Linn.	Liliaceae	Nabhi	Herb	Tuber	Backache
71.	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae	Konda gilugu	Tree	Leaf	Wounds
72.	*Glycyrrhiza glabra* (Retz.) DC.	Fabaceae	Athimadhuram	Shrub	Root	Cough
73.	*Gmelina arborea* Roxb.	Verbenaceae	Gummadu	Tree	Leaf	Headache
74.	*Helicteres isora* Linn.	Sterculiaceae	Nulidhada	Shrub	Fruit	Dysentery
75.	*Heliotropium indicum* Linn	Boraginaceae	Naga danti	Herb	Leaves	Dog bite
76.	*Hibiscus vitifolius* Linn.	Malvaceae	Kondapathi	Shrub	Root	Tumour
77.	*Hoya pendula* R. Br.	Asclepiadaceae	Pala thiga	Shrub	Root	Jaundice
78.	*Indigofera linnaei* Ali	Fabaceae	Chala pachi	Herb	Leaves	Asthma
79.	*Jatropha curcas* Linn.	Euphorbiaceae	Dola chettu	Shrub	Latex	Wounds
80.	*Justicia glauca* Rottl.	Acanthaceae	kommu kura	Herb	Leaf	Backache
81.	*Lawsonia inermis* Linn.	Lythraceae	Gorintaku	Shrub	Leaf	Headache
82.	*Leonotis nepetiifolia* (Linn.) R. Br.	Lamiaceae	Pedha ranaberi	Herb	Flowers	Cuts
83.	*Leucas cephalotes* (Roth) Spreng.	Lamiaceae	Tummi koora	Herb	Leaves	Headache
84.	*Limonia acidissima* Linn.	Rutaceae	Velaga	Tree	Fruit	Dysentery
85.	*Madhuca indica* Gmel.	Sapotaceae	Ippa	Tree	Bark	Dog bite
86.	*Marsilea quadrifolia* Linn.	Marsileaceae	Chenchalam koora	Herb	Leaves	Skin disease
87.	*Martynia annua* Linn.	Martyniaceae	Telukondi	Herb	Fruit	Scorpion sting
88.	*Mucuna pruriens* (Linn.) DC.	Fabaceae	Dula dama	Herb	Fruit	Dysentery
89.	*Musa paradisiaca* Linn.	Musaceae	Arati	Herb	Tuber	Dysentery
90.	*Strychnos potatorum* Linn. *f*.	Loganiaceae	Induga	Tree	Root	Skin disease
91.	*Tephrosia procumbens* Buch.-Ham.	Fabaceae	Vempali	Herb	Root	Stomachache
92.	*Thalictrum foliolosum* DC.	Ranunculaceae	Piyaranga	Herb	Root	Rheumatism

93.	*Urena lobata* Linn	Malvaceae	Puliadugu	Herb	Root	Stomachache
94.	*Vernonia cinerea* (Linn.) Less.	Asteraceae	Sahadevi	Herb	Plant	Fever
95.	*Zizyphus mauritiana* Lam.	Rhamnaceae	Regu	Tree	Fruit	Cold

IV. RESULT AND DISCUSSION

The results of the present survey are presented in Table 1. A total of 95 plant species (belonging to 82 genera and 50 families) of ethnobotanical interest were reported. For each species the following ethnobotanical information were provided: botanical name, vernacular name, family, plant parts used and their use in treatment of diseases. The dominant families of ethnobotanical importance are Fabaceae (11 species), Euphorbiaceae (7 species), Asteraceae (6 species), Caesalpiniaceae (5 species), Zingiberaceae (4 species), Malvaceae, Acanthaceae, Rutaceae, Boraginaceae, Moraceae and Lamiaceae (3 species), Cannaceae, Mimosaceae, Amaranthaceae, Cucurbitaceae, and Bombacaceae, (2 species). The medicinal plants based on their use in treatment of 32 different diseases were found to be very valuable such as Jaundice, rheumatism, asthma, diabetes, piles, Leucoderma, paralysis, snake bite, etc. The 95 medicinal plants were reported to be used in curing 32 diseases, of which 12 species each for used in the treatment of Skin diseases, eight each for treating dysentery, seven each in treating wounds, six for each in treating jaundice and stomachache, 5 species treating in cough, four for used in treating rheumatism, Galactogauge, and headache etc. Information on plant species regarding botanical name, local name, family and medicinal uses are presented. The Most of the herbal remedies are taken externally in the form of extract and decoction. A significant finding of this study is that, most of the plants collected in Salugu Panchayati hill range of Visakhapatnam District are the first reports. Among the different plant parts used for the preparation of medicine the leaves were the most important and frequently used and majority of the remedies reported in the present study are by administering the leaves orally.

Fig. 1. Study area.



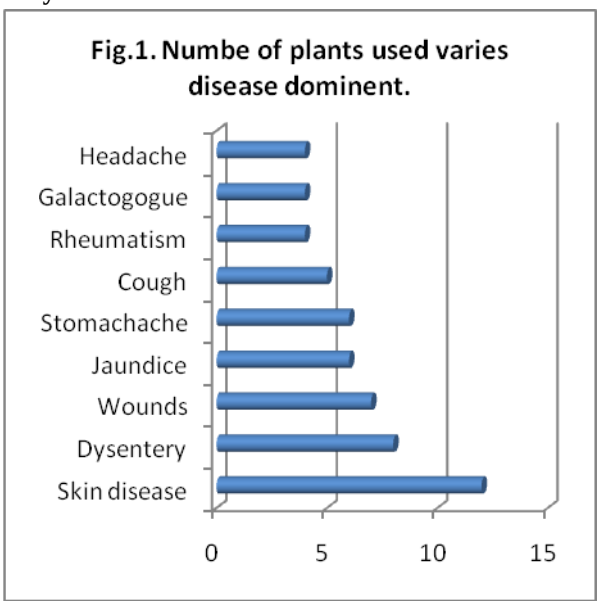


Fig. 3. Parts wise analysis of Ethnomedicinal plants.

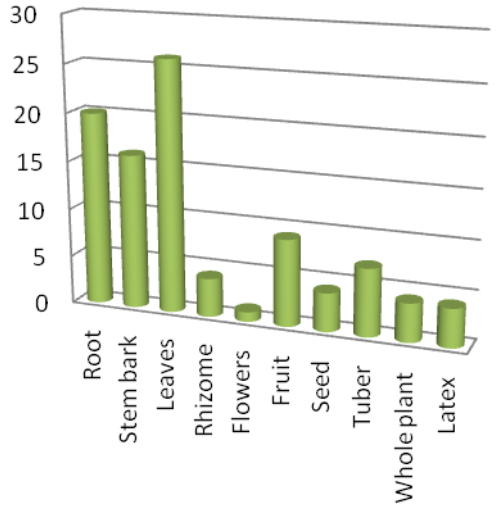
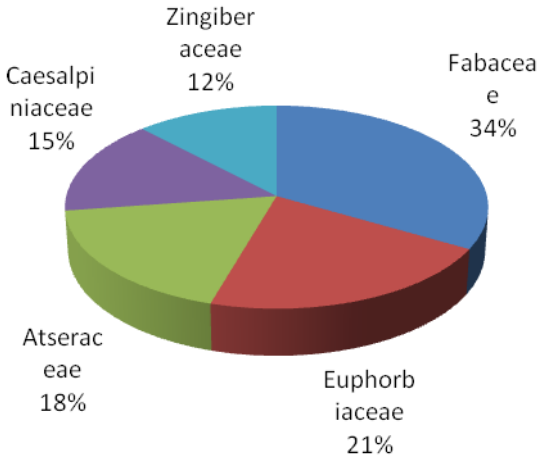


Fig. 4. Dominated families of Ethnomedicinal plants.



V. CONCLUSIONS

The popular use of herbal remedies among the tribal people in Parvathipuram hill range of Visakhapatnam district reflects the revival of interest in traditional medicine. The scientific validation of these remedies may help in discovering new drugs from the plant species. The information on therapeutic uses of plants may provide a great potential for discovering of new drugs and promoting awareness among the people to use them as remedy in health care system.

VI. ACKNOWLEDGEMENT

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REFERENCE

[1]. Rao, V.L.N., B. R. Busi, B. Dharma Rao, Ch. Seshagiri Rao & M. Vemkaiah. Ethnomedicinal practices among *Khonds* of Visakhapatnam district, Andhra Pradesh. *Indian Journal of Traditional Knowledge* Vol. 5 (2). 2006, 217--219.

[2]. Pal, D.C. & D.K. Banerjee. Some less known plant foods among the tribals of Andhra Pradesh and Orissa states. 1971, *Bull. Bot. Surv. India* 13: 221-223.

[3]. Nisteswar, K. & K. A. Kumar. Utilization values of medical-lore of Rampa Agency (Andhra Pradesh) in primary health care, 1980. *Sachitra Ayurved* 33: 210-212.

[4]. Nisteswar, K. & K.A. Kumar. Equity in folklore medicine of Addateegala Agency tract of East Godavari district of Andhra Pradesh. *Vaghabhata* , 1983. 1: 43-44.

[5]. Ramarao, N. & A.N. Henry. The Ethnobotany of Eastern Ghats in Andhra Pradesh, India, 1996. Botanical Survey of India, Kolkata.

[6]. Jain SK. *A manual of Ethnobotany*. 1987, *Scientific publishers, Jodhpur, India*.

[7]. Hemdri K, CRR Sarma and SS Rao. Medicinal plant wealth of Andhra Pradesh, Part-I. *Ancient Science of Life*. 1987, 6:167-186.

[8]. Hemdri K CRR Sarma and SS Rao. Medicinal plant wealth of Andhra Pradesh, Part-II. *Ancient Science of Life. 1987*, 7(5)5-64.

[9]. Jeevn Ram A, RV Reddy, M Adharvana Chari and RR Venkata Raju. Rare and Little known medicinal plants from Nallamalais of the Eastern Ghats, India. *Journal of Plant Science*. 2007. 2(1) 113-117.

[10]. Madhusudan Rao A, *A floristic studies on the Flora of Kadapa District, A.P. India*, Ph.D., Thesis, 1989, Sri Venkateswara University, Tirupathi.

[12]. Jain S.K. *Dictionary of Indian folk medicine and Ethnobotany*. Deep publications, 1991, New Delhi.

[13]. Jain SK and RR Rao. Hand Book of Field and Herbarium Methods. (*Today and Tomorrow Printers and Publishers)*, 1997, BSI, Calcutta.

[14]. Gamble JS and Fischer CEC. Flora of the Presidency of Madras, 1-3 (Adlard & Son, London), 1915-1936.

[15]. Chandra Babu N, MTarakeswar Naidu and M Venkaiah. Ethnobotanical plants of Kotia hills of Vizianagaram district, Andhra Pradesh, India. *Journal of Phytology*. 2010, 2(6): 76-82.

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Content Based Video Retrieval Using Cluster Overlapping

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ABSTRACT:

To retrieve videos from database efficient video indexing and retrieval mechanisms are required. In this paper, we propose an efficient algorithm to retrieve videos from the database when a video clip is given as a query. To efficiently match query video clip with the videos in the database various spatio-temporal features are used. Clustering algorithms are applied to extracted features for fast retrieval. Cluster overlapping method is used to retrieve relevant videos. Relevant videos are ranked based on the similarity measurement and frequency of query shots in the retrieved videos. Experimental result proves that proposed method has high precision and recall compared to conventional algorithms.

Keywords: Content based video retrieval, key frame, video indexing, shot clustering

I. INTRODUCTION

There are various content based video retrieval and indexing methods which uses spatio-temporal features. For video indexing, Jianping Fan et al. [1] proposed hierarchical video shot classification method. In hierarchical video shot classification method video is structured in to hierarchical tree using semantics of the video. H. Farouk et al. [2] proposed video indexing and retrieval algorithm using wavelet coefficients that are extracted from video frames. Ja-Hwung Su et al. [3] proposed video indexing and retrieval mechanism using pattern trees constructed from the video shot patterns in a video. They have used fast pattern index tree and advanced pattern index tree for indexing and ranking of the videos. Stacie Hibino and Eke A. Rundensteiner analyzed videos in terms of temporal relationship between events [4]. First step in video indexing and retrieval is temporal video segmentation. Various methods are proposed for temporal video segmentation [5], [6], [7], [8], which are efficient in dividing video into shots.

II. PROPOSED METHOD

In the proposed system we have used various spatio-temporal features of the video and clustering methods to efficiently retrieve videos from the database when a video clip is given as a query. Intersection of various clusters is found in order to find the relevant videos from the database. The shots which are present in the intersection of relevant clusters are ranked based on the similarity between query shots and their frequency of appearance in the videos. Detailed architectural diagram is given in figure 1.

2.1. Spatio-temporal features

Database videos are divided into shots using combined color, edge and motion features [9]. Using these features, adjacent frames in video are compared in order to find the shot boundary. One key frame is selected from the each shot using mutual information and image entropy [10]. Key frames selected from videos are given in figure 2. For getting color information from keyframes, RGB color histogram is used. Before the extraction of color histogram each frame in a video is quantized in to 86 intensity levels. Texture information from a frame is calculated using tamura features [11]. Features that are extracted for texture information are coarseness, directionality, regularity and degree of contrast. Canny edge detector is used to extract edge information [12]. For extracting edge features each frame is divided into 16 sub-blocks and edge direction and its count from each block is calculated. Edge direction information is obtained by convolving edge image with various filters. Optical flow algorithm is used for getting motion vectors from the keyframe. Another temporal feature extracted from video shots is camera motion. Camera motion in a video is classified into irregular camera motion, still camera, smooth camera, little camera motion and no camera motion [13]. In the same manner motion vectors in the key frame is classified into four type no motion, small motion, medium motion and large motion. After finding motion vectors using Lucas Kanade's algorithm frame is divided into 16 sub-blocks. For each block based on the motion vectors we determine motion of that block as one among the four types of motion vectors- no motion, large motion, small motion, and medium motion.

2.2. Clustering

After feature extraction shots are clustered, using features extracted. Let S_1, S_2, S_3,.....,S_N be the shots in the database after temporal segmentation of videos in the database. Using RGB color histogram feature these shots are grouped in to M number of clusters. K-means clustering algorithm is used for clustering the shots. The same N number of temporally segmented shots is again clustered using texture properties. This clustering process is also done using motion pattern in keyframe, camera motion and edge features.

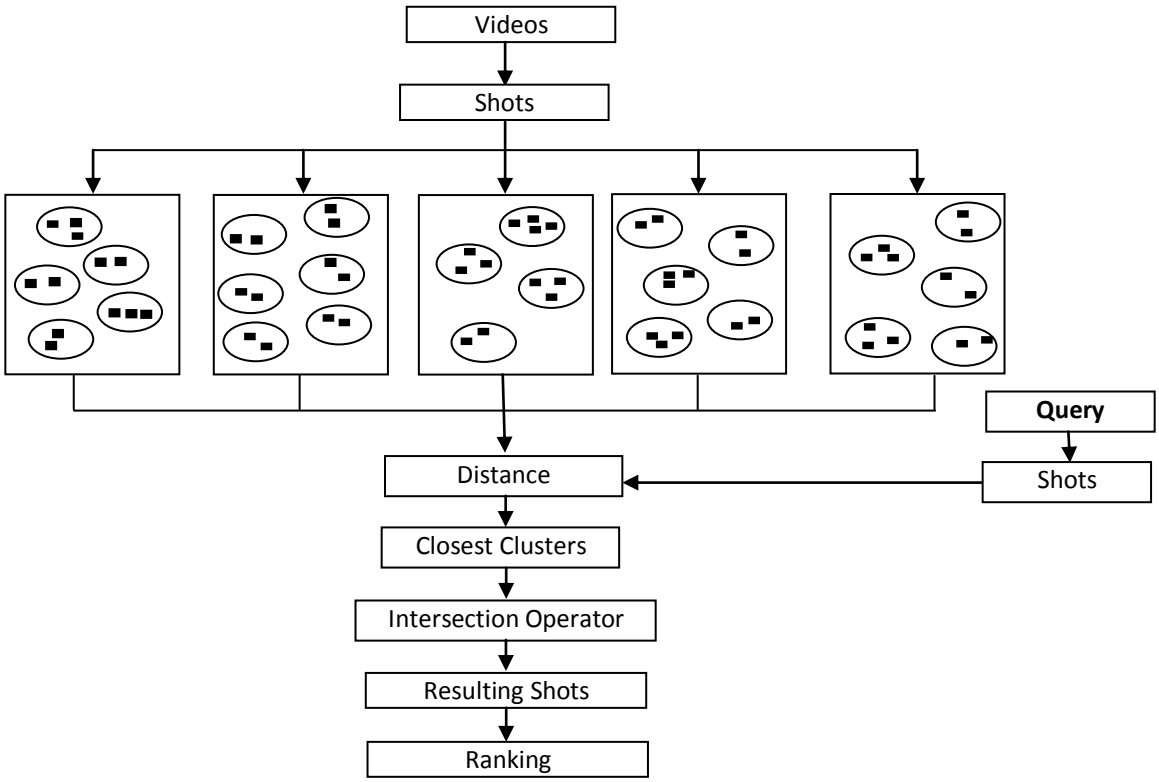

Fig. 1. Overall system architecture

Now we have 5 clusters video shots using the features RGB color histogram, texture, camera motion, motion vectors from keyframe and using edge information. Let CH_1, CH_2, CH_3, ..., CH_p be the clusters using color histogram, T_1, T_2, T_3,.....T_q be the clusters using texture, E_1, E_2, E_3,....E_r be the clusters using edge information, MP1, MP_2, MP_3,....., MP_t be the clusters formed using motion pattern and MC_1, MC_2, MC_3,.....MC_v are the clusters formed using camera motion pattern.

Let Cs={ CH_1, CH_2, CH_3, ..., CH_p }, Ts={ T_1, T_2, T_3, ..., T_q }, Es={ E_1, E_2, E_3, ..., E_r}, Ms={ MP1, MP_2, MP_3, ..., MP_t } and Ps={ MC_1, MC_2, MC_3, ..., MC_v}. After extracting features from the query shots, one closest cluster from Cs, Ts, Es, Ms and Ps is selected for each query shot. Let CH_a, T_b, E_c, MP_d and MC_e are the clusters which is close to the first shot in the query, where $1< a <p$, $1< b <q$, $1< c <r$, $1< d <t$ and $1< e <v$.

Let S be the set of shots which is contained in CH_a, T_b, E_c, MP_d and MC_e. The set S is defined as intersection of CH_a, T_b, E_c, MP_d and MC_e i.e., For first shot in the query, the shot result set is given by $S = CH_a \cap T_b \cap E_c \cap MP_d \cap MC_e$. Let S= {$S_1$, S_2, S_3,.....,S_{lm}} be the shot result set for first shot in the query where S_i, $i \in [1..lm]$ represents the shots which are similar to the first shot in the query. If $|S| < R_{Thres}$ or $S = \varnothing$ then the set is updated to $S = S \cup (CH_a \cap E_c \cap MP_d \cap MC_e)$. If still $|S| < R_{Thres}$ or $S = \varnothing$ then S is updated to $S = S \cup (CH_a \cap E_c \cap MP_d)$. If still $|S| < R_{Thres}$ or $S = \varnothing$ then again S is updated to $S = S \cup (CH_a \cap E_c \cap MP_d)$. Where R_{Thres} is the minimum number of results required in the result set. The similarity between shots is measured using Euclidean distance.

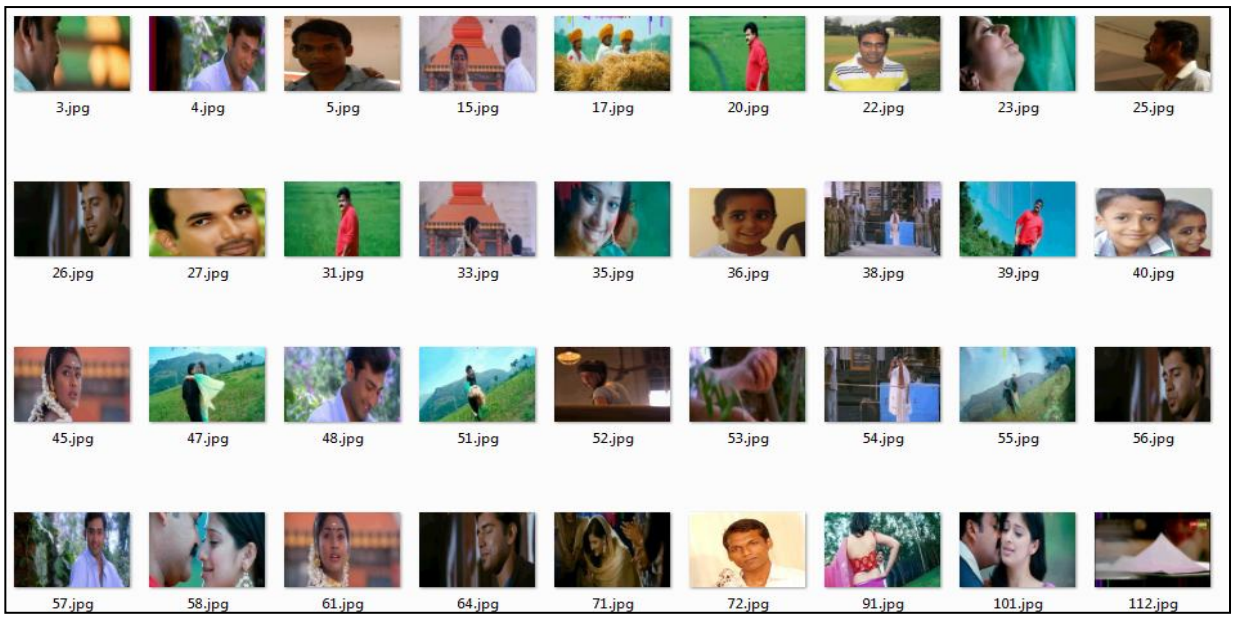

Fig. 2: Keyframes

Let database videos be denoted as V={$Video_1$, $Video_2$, ...,$Video_z$}, and each video contains a set of shots. A video clip $Video_i$ is represented as$Video_i$= {$shot_k$, $shot_{k+1}$, ...,$shot_j$}, where $Video_i$ϵV. Let us assume that there are four videos in the database and each video contains sets of shots as in Table 1.

Table 1

Video	**Shots**
$Video_1$	$shot_1$,$shot_2$,$shot_3$,$shot_4$,$shot_5$
$Video_2$	$shot_6$,$shot_7$,$shot_8$,$shot_9$,$shot_{10}$
$Video_3$	$shot_{11}$,$shot_{12}$,$shot_{13}$,$shot_{14}$,$shot_{15}$
$Video_4$	$Shot_{16}$,$shot_{17}$,$shot_{18}$,$shot_{19}$,$shot_{20}$

For example, assume that query video clip contains 4 shots, denoted as follows {qShot1, qShot2, qShot3, qShot4}.For the first shot in the query, qShot1, the retrieved shots and their similarity measured using above method is given in Table 2.

Table 2

Query shot	Retrieved Shot	Video	Similarity%	Appear_val
qShot1	$Shot_7$	$Video_2$	90	1
	$Shot_2$	$Video_1$	88	1
	$Shot_{16}$	$Video_4$	76	1
	$Shot_{20}$	$Video_4$	57	2
	$Shot_5$	$Video_1$	45	2

Table 3, Table 4, Table 5 shows retrieved shots for the second, third and fourth shot in the query respectively.

Table 3

Query shot	Retrieved Shot	Video	Similarity%	Appear_val
qShot2	$Shot_8$	$Video_2$	93	1
	$Shot_3$	$Video_1$	82	1
	$Shot_{17}$	$Video_4$	72	1
	$Shot_{13}$	$Video_3$	56	1
	$Shot_2$	$Video_1$	32	2

Table 4

Query shot	Retrieved Shot	Video	Similarity%	Appear_val
qShot3	$Shot_9$	$Video_2$	91	1
	$Shot_4$	$Video_1$	73	1
	$Shot_{18}$	$Video_4$	59	1
	$Shot_3$	$Video_1$	52	2
	$Shot_{17}$	$Video_4$	49	2

Table 5				
Query shot	Retrieved Shot	Video	Similarity%	Appear_val
qShot4	$Shot_5$	$Video_1$	88	1
	$Shot_{10}$	$Video_2$	84	1
	$Shot_{19}$	$Video_4$	76	1
	$Shot_{18}$	$Video_4$	72	2
	$Shot_6$	$Video_2$	57	2

	Table 6	
Video	Similarity	Rank
$Video_1$	369.83	2
$Video_2$	375.15	1
$Video_3$	56	4
$Video_4$	321.83	3

The videos are ranked based on the visual similarity and number of times shots are appeared in the retrieved shots.Rank of each video is calculated by summing highest rank of video in each table. The final rank of each video is calculated by using following formula.

$Fin\_Rank(Video_i)$= (∑Highest similarity from each table corresponding to $Video_i$) +∑ (similarity× log(Appear_val)).

$Video_1$=88+82+73+88+(88)(log1)+(45)(log2)+(82)(log1)+(32)(log2)+(73)(log1)+(52)(log2)+(88)(log1)=369.83 , $Video_2$=90+93+91+84+(57)(log2)=375.15, $Video_3$=56, $Video_4$=76+72+59+76+(57)(log2)+(72)(log2)=321.83.

Fig. 3 : Result

	Table 7	
Video	No. of frames	No. of shots
Movie 1	41548	1598
Movie 2	49500	1980
Movie 3	42840	1785
Football	28896	1204
Cricket	23472	978
Campus video	27700	1108

III. EXPERIMENTAL RESULTS

The video database of our experiments is summarized in Table7. The number of clusters for each feature is selected manually. In the experiments performed, the average precision of 85% and 76% recall were obtained. Figure3shows frames from a video query clip and retrieved video clips. The retrieved video clips are very close to that of a query clip. The experimental results are shown in figure 4.

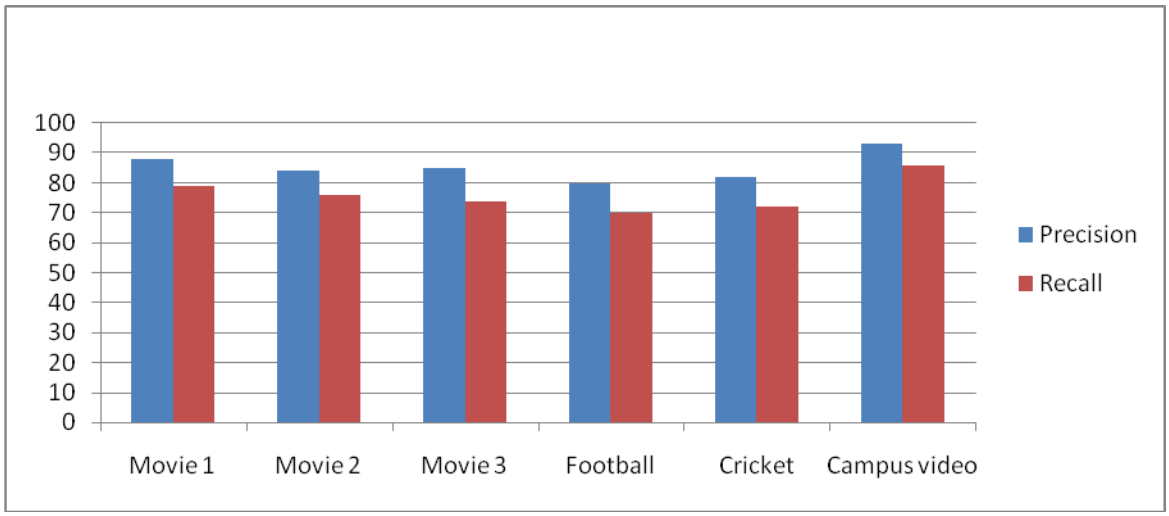

Fig. 4. Performance

REFERENCES

[1] Jianping Fan, Ahmed K. Elmagarmid,Xingquan Zhu, Walid G. Arefand Lide Wu *"Class View*: Hierarchical Video Shot Classification, Indexing, and Accessing," *IEEE TRANSACTIONS ON MULTIMEDIA*, VOL. 6, NO. 1, FEBRUARY 2004.

[2] Farouk, H.; Elsalamony, H. A., "Digital library creation based on wavelet coefficients for video stream indexing and retrieving," *Signal Processing Systems (ICSPS), 2010 2nd International Conference on* , vol.1, no., pp.V1-158,V1-162, 5-7 July 2010

[3] Ja-Hwung Su, Yu-Ting Huang, Hsin-HoYeh, Vincent S. Tseng "Effective content-based video retrieval using pattern-indexing and matching techniques,"*Expert Systems with Applications* 37 (2010) 5068–5085.

[4] Hibino, S.; Rundensteiner, E.A., "A visual query language for identifying temporal trends in video data," *Multi-Media Database Management Systems, 1995. Proceedings., International Workshop on* , vol., no., pp.74,81, 28-30 Aug 1995.

[5] ZhiyiQu; Ying Liu; LipingRen; Yong Chen; RuidongZheng, "A method of shot detection based on color and edge features," *Web Society, 2009. SWS '09. 1st IEEE Symposium on* , vol., no., pp.1,4, 23-24 Aug. 2009.

[6] *Junaid Baber, NitinAfzulpurkar, Matthew N. Dailey, and MaheenBakhtyar*, "Shot boundary detection from videos using entropy and local descriptor," *Digital Signal Processing (DSP), 2011 17th International Conference on* , vol., no., pp.1-6, 6-8 July 2011.

[7] G.G.LakshmiPriya, S.Domnic, "Video Cut Detection using Hilbert Transform and GLCM," *IEEE-International Conference on Recent Trends in Information Technology*, ICRTIT 2011 978-1-4577-0590-8/11.

[8] WenzhuXu, LihongXu, "A novel shot detection algorithm based on clustering," *Education Technology and Computer (ICETC)*, 2010 2nd International Conference on , vol.1, no., pp.V1-570-V1-572, 22-24 June 2010.

[9] Jacobs, A., Miene, A., Ioannidis, G. T., and Herzog, O. Automatic shot boundary detection combining color, edge, and motion features of adjacent frames. In TRECVID 2004, pp. 197--206, 2004.

[10] Lina Sun; Yihua Zhou, "A key frame extraction method based on mutual information and image entropy," *Multimedia Technology (ICMT), 2011 International Conference on* , vol., no., pp.35,38, 26-28 July 2011

[11] Tamura, Hideyuki; Mori, Shunji; Yamawaki, Takashi, "Textural Features Corresponding to Visual Perception," *Systems, Man and Cybernetics, IEEE Transactions on* , vol.8, no.6, pp.460,473, June 1978

[12] Canny, John, "A Computational Approach to Edge Detection," *Pattern Analysis and Machine Intelligence, IEEE Transactions on* , vol.PAMI-8, no.6, pp.679,698, Nov. 1986

[13] Haoran Yi , DeepuRajan , Liang-Tien Chia, A new motion histogram to index motion content in video segments, Pattern Recognition Letters, v.26 n.9, p.1221-1231, 1 July 2005

Effective and Secure Content Retrieval in Unstructured P2P Overlay Networks using Bloom Cast Technique

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ABSTRACT:

P2P network stands among one of the best and popular network tool. This technique made the sharing of contents through internet easier. For unstructured P2P networks Bloom Cast serves as an efficient technique for full-text retrieval scheme. In order to achieve a guaranteed recall at a communication cost of the network, Bloom Cast makes copies of the contents in the network uniformly at a random across the P2P networks. To encode the complete document the Bloom Cast utilizes Bloom Filters. To support random node sampling and network size estimation Bloom Cast utilizes its hybrid network which is a combination of a lightweight DHT and an unstructured P2P overlay. There are possibilities of malicious codes and false transactions in unstructured P2P networks. At times it generates false identities resulting in false transactions with other identities. The proposed method here uses the concept of DHT and reputation management which provides efficient file searching. For secure and timely availability of the reputation data from one peer to the other peers the self certification (RSA ALGORITHM and MD5) is used. The peers are here repeated in order to check whether a peer is a malicious peer or a good peer. The transaction is aborted at once a malicious peer is detected. The identity is attached to the peer that has reputation. The peers are provided with identity certificates which are generated using self-certification, and all of them maintain their own (and hence trusted) certificate authority which issues the identity certificate(s) and digital signature to the peer.

Keywords: *Bloom Cast, Bloom Filters, MD5 with RSA Algorithm, Self-Certification.*

I. INTRODUCTION

An overlay network is a type of the computer network which is built on the top of another existing network. Nodes that are present in the overlay network can be thought of as being connected as virtual links or logical links, each one of which corresponds to an appropriate path connected through many physical links, in the existing network. The major applications of overlay networks are distributed systems such as cloud computing, peer-to-peer systems, and client-server systems. They are known so because they run on top of the Internet. Initially the internet was built as an overlay network upon the telephone network whereas nowadays with the invention of VoIP, the telephone network is turning into an overlay network that is built on top of the Internet. The area in which the overlay networks used is telecommunication and internet applications.

Overlay networks provide us with the following advantages and opportunities to better utilize the increasingly growing Internet information and resources. (1) In overlay networks the network developers and application users can easily design and implement their own communication environment and protocols over the Internet. For example data routing and file sharing management. (2) Routing data's in an overlay network is very flexible. It can be quickly detectable and network congestions can be avoided by adaptively selecting paths based on different metrics such as probed latency. (3) Due to flexible routing the end-nodes in overlay networks are highly connected to each other. One end-node can always communicate to another end-node via overlay network as long as the physical network connections exist between them. Thus scalability and robustness in overlay networks are two attractive features. (4) The increasingly more end-nodes of high connectivity, to join overlay networks enables effective sharing of a huge amount of information and resources available in the Internet.

Typical overlay networks include multicast overlays, peer-to-peer overlays (e.g. Gnutella and Kazaa).

1.1. Searching in structured networks

Structured P2P networks employ a globally consistent protocol to ensure that any node can efficiently route a search to some peer that has the desired resource or data, even if it a rare one. But this process needs more structured pattern overlay links. The most commonly seen structured P2P network is to implement a distributed hash table (DHT), in which deviating of hashing is used to assign ownership of files to that particular peer. It is not similar to the traditional hash table assignment in which in a for a particular array slots a separate key is assigned. The term DHT is generally used to refer the structured overlay, but DHT is a data structure that is implemented on top of a structured overlay.

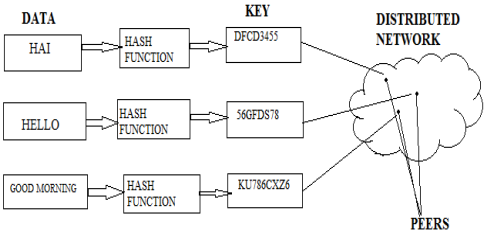

Figure.1 DHT (Distributed hash Table)

A distributed hash table (DHT) is a class of a decentralized distributed system that provides a lookup service similar to a hash table; (key, value) pairs that are stored in a DHT. Any participating node can efficiently retrieve the value associated with a given key. Maintenance of mapping from keys to values is distributed among the nodes in such a way that a change in the set of participants causes a minimal amount of disruption. This allows DHT to scale to extremely large numbers of nodes and to handle operations such as continuous arrival of nodes, departure, and failure.

DHT based P2P systems have several advantages such as it is scalable, robust and efficient. As a result, DHT has become a general infrastructure for building many P2P distributed applications. Applications such as content delivery, physical goods exchange, services or spaces, networking, science and searches adds more advantage to DHT.

Here we use bloom filters, which is a hash based data structure used to reduce the amount of communication required. It has more benefit that it compares the keyword with the entire match list and found the exact match of the keyword. Here we can easily find the locality of the document where it is actually present. We can search the content with less amount of time.

This allows to achieve higher lookup performance for a given memory bandwidth, without requiring large amounts of buffering in front of the lookup engine.

1.2. Searching in Unstructured networks

Unstructured P2P networks are formed when the overlay links are established randomly. The networks here can be easily constructed by copying existing links of another node and then form its own links over a time. In an unstructured P2P network if a peer wants to find out a desired data in the network the query is flooded through the network. This results in finding many peers that share their data. The major disadvantage here is that the queries may not be resolved frequently. If there exists popular content then the available peers and any peer searching for it is likely to find the same thing. In cases where a peer is looking for rare data shared by only a few peers, then it is highly improbable that search will be successful. Since the peer and the content management are independent of each other, there is no assurance that flooding will find a peer that has the desired data. Flooding causes a high amount of signaling traffic in the network. These networks typically have poor search efficiency. Popular P2P networks are generally unstructured.

II. CREATING AN UNSTRUCTURED P2P NETWORK

Peer-to-peer (P2P) computing or networking is a distributed application architecture that divides the tasks among the peers. Peers are active and more privileged participants in the application. They are said to form a P2P network of nodes.

These P2P applications become popular due to some files sharing systems such as Napster. This concept paved a way to new structures and philosophies in many areas of human interaction. Peer-to-peer networking has no restriction towards technology. It covers only social processes where peer-to-peer is dynamic. In such context peer-to-peer processes are currently emerging throughout society.

Peer-to-peer systems implement an abstract overlay network which is built at Application Layer on the top of the physical network topology. These overlays are independent from the physical network topology and are used for indexing and peer discovery. The contents are shared through the Internet Protocol (IP) network. Anonymous peer-to-peer systems are interruption in the network, and implement extra routing layers to obscure the identity of the source or destination of queries.

III. CONTENT SEARCHING USING BLOOM CAST

In this section we are going to have a detailed discussion about the concepts of content searching and bloom cast.

3.1. Content Searching

In unstructured peer to peer, information about one peer is unknown to the other. (i.e.) to enable communication between the peers, the peers in the network should know some information about the other peer in the network.

The proposed system uses the distributed hash table where each and every peer has the separate hash table. The information stored in the hash table is based on Reputation management (tracking users past activity).It helps to perform the file searching operation efficiently.

In a content search function, the input is a set of keywords representing a user's interests and the output is a set of resources containing these keywords. In the content search context, resources represent text documents or metadata of general resources. Some of these resources are software applications, computer platforms, or data volumes. Content search is useful when a user does not know the exact resource names of interests; this case is common in P2P-based searches as well as in web searches.

Flooding is the basic method of searching in unstructured P2P networks; however, large volume of unnecessary traffic is seen in blind flooding based search mechanism. This greatly affects the performance of P2P systems. The further study shows that a large amount of this unwanted traffic is divinable and can be avoided while searching in P2P networks.

The bloom hash table is used to store the resources which help in effective searching of resources with desired capabilities. Information about the path-name is also provided by the bloom hash table. This design enables resource discovery without knowledge of where the corresponding data items are stored.

3.2. Bloom Cast

Bloom Cast is a novel replication strategy to support efficient and effective full-text retrieval. Different from the WP scheme, random node sampling of a lightweight DHT is utilized by the Bloom Cast. Here we generate the optimal number of replicas of the content in the required workspace. The size of the networks is not depending on any factor since it is an unstructured P2P network. The size of the network is represent here as N. By further replicating the optimal number of Bloom Filters instead of the raw documents, Bloom Cast achieves guaranteed recall rate which results in reduction of communication cost for replication. Based on the Bloom Filter membership verification we can easily design a query evaluation language to support full-text multi keyword search.

Bloom Cast hybrid P2P network has three types of nodes: they are structured peers, normal peers, and bootstrap peers. A Bloom Cast peer stores a collection of documents and maintains a local storage also known as repository. A bootstrap node maintains a partial list of Bloom Cast nodes it believes are currently in the system. There are many ways to implement the bootstrap mechanism in the previous P2P designs.

3.3. Bloom Filters

Bloom Filters to encode the transferred lists while recursively intersecting the matching document set. A Bloom Filter is an efficient data structure method that is used to test whether the element belongs to that set or not. False positive retrieval results are also possible, but false negatives are not possible; i.e. a query returns either it is 'inside the set' or 'not inside the set'. Elements can only be added to the set and cannot be removed. When more elements are added to the set then the probability of false positives increases. Bloom Casting is a secure source specific multicast technique, which transfers the membership control and per group forwarding state from the multicast routers to the source. It uses in-packet Bloom filter (iBF) to encode the forwarding tree. Bloom Casting separates multicast group management and multicast forwarding.

It sends a Bloom Cast Join (BC JOIN) message towards the source AS. The message contains an initially empty collector Bloom filter. While the message travels upstream towards the source, each AS records forwarding information in the control packet by inserting the corresponding link mask into a collector. After this, it performs a bit permutation on the collector.

The figure for Bloom Filter and their memory storage is designed here to show the interconnections between source and specific multicast protocols. In Bloom Cast the transit routers do not keep any group-specific state. But in traditional IP multicast approaches the forwarding information is installed in routers on the delivery tree.

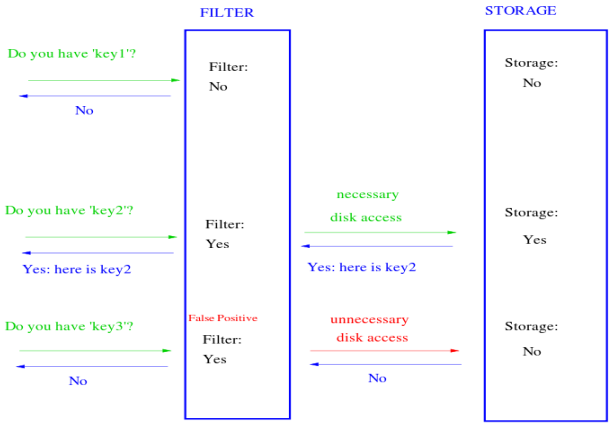

Figure.2 Bloom Filters

The above figure clearly explains the working mechanism of the bloom filters. If the user wants to search any content, initially the query is given. Then there available three possibilities of the result. The first of that is the bloom filter will initially check whether the required content is actually present in the storage area, if it finds the key in storage, then it will gives the positive result to the user. The second is, if the original content is not found in the storage, then it will give the negative result. The third is, the original content may be deleted from the storage area and due to un-updating of the content, the bloom filter may have the chance to show the false positive results.

IV. SELF CERTIFICATION AND CONTENT AUDITING

Each and every peer has the unique identity, based on this, the peer is identified and the transaction is begined. The certification is attached with identity of the peer. The certification uses the concept of RSA, where the algorithm generates the private key and public key, these identities are attached with reputation of the given peer. The sender sends the information which is associated with its private key and signature, the receiver encrypts using its public key, these in formations are updated periodically in Distributed Hash Table. DHT allows to search for specific content identified by a hash key and to eventually perform Boolean operations upon the results of searches that used different keys .It provides considerable fast search times in respect to unstructured solutions. Using the index value the files are stored and retrieved. If malicious peer performs false transaction means it can be identified easily and the transaction is aborted.

The reputation of a peer is associated with its handle. This handle is commonly termed as the "identity" of the peer even though it may not be a peer it receives a recommendation for each transaction performed by it. All of its recommendations are accumulated together for calculating the reputation of a given peer.

Self-certification obviates the centralized trusted entity needed for issuing identities in a centralized system. Peers using self-certified identities remain pseudononymous in the system as there is no way to map the identity of a peer in the system to its real-life identity.

A malicious peer can use self-certification to generate a large number of identities and thereby raising the reputation of one of its identities by performing false transactions with other identities. There is no need for the malicious peer to collude with other distinct peers to raise its reputation. It only needs to generate a set of identities for itself.

By using the content auditing technique we can easily identify whether the received content is hacked (modified) or not. Here we designed the training set of data. During content auditing the original data is compared with the training set of data. The user can set the probability level for audit the content. If the training sets are matched with the original data and it is up to the threshold level, then the user can predict that there is no hacking occurs, or else the hack is occurred and the rate of hacked content is also known.

V. EXPERIMENTAL EVALUATION

The proposed method is implemented using java. Here we have done the entire work as the simulation using the java simulation tool. The initial step is to create the unstructured P2P network. Each peer consists of the unique port number and IP address. Any number of peers can be created in the network according to the user's requirement. From peer the user can send request and receive response. In the network the query can be posted from any of the peers. It will display if the required content is found in Bloom Filter. Otherwise, it passes the query to next peer. The bloom cast stores the filename (key) in the form hash code. The actual filename is converted into binary values. Then the hash codes are generated with the corresponding binary values. Then the required files are sent to the corresponding work space created by the user.

Since it is the unstructured P2P network, there is no central control. In order to provide security to the user, we preferred the self certification technique. It provides a unique identity to each and every peer in the network. That identity is known as the self certificate. It consists of information such as serial number, public key, IP address, port address. These certificates are assigned for the trust of the user.

After that by using the content auditing method, the user can able to identify whether the received content is hacked or not. If the contents are matched with the training set, then the user will receive the original content. If the contents are not matched with the training set, then the user will receive the hacked (modified) content. Then the user can also predict the rate of the content auditing.

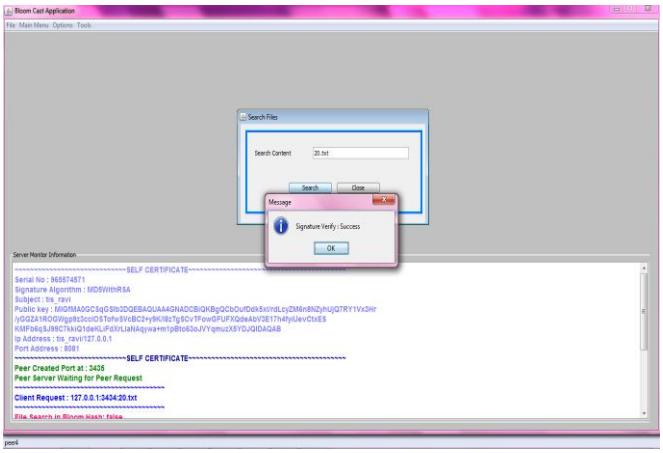

Figure.3.Signature gets verified during content searching, if there is no hacked content

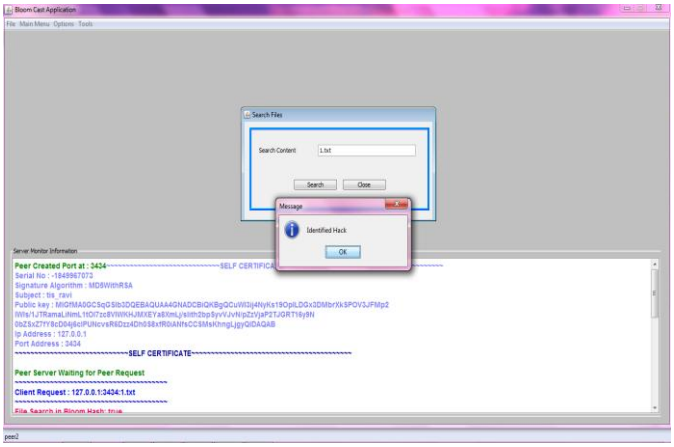

Figure.4.Signature doesn't gets verified and identified hack

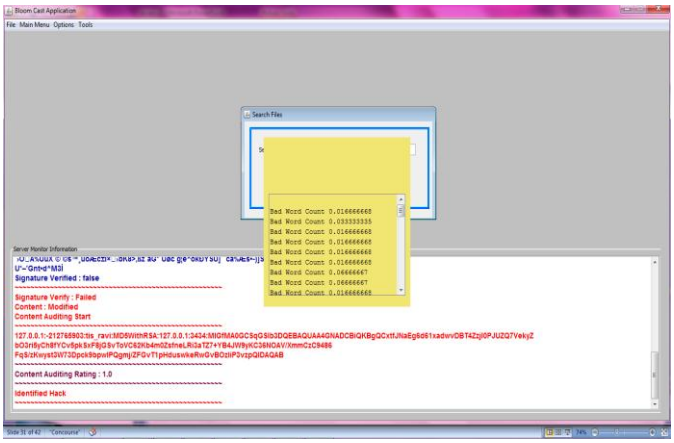

Figure.5. Content Auditing Rating after identify the hack

VI. CONCLUSION

By examining the results of the bloom hash table, we found that this is significantly faster than a normal hash table using the same amount of memory, hence it can support better throughput for router applications that use hash tables.

We here propose an efficient and secured full-text retrieval scheme in an unstructured P2P networks using Bloom Cast method. Bloom Cast method guarantees the recall with high probability. Thus it is considered more effective. The overall communication cost of a full-text search is reduced below a formal bound. Thus it is one among the reason that Bloom Cast is efficient and effective among other schemes. Moreover the communication cost for replication is also reduced because we replicate Bloom Filters instead of the raw documents across the network.

During the transfer of files there is possible of distribution of viruses, worms and trojan horses and malicious peers to overcome this the self certification (MD5 with RSA) is used, it provides authentication and authorization. It easily finds the malicious peers and aborts the transaction. Therefore the proposed method provides the efficient and secure communication between the peers.

Further the content auditing method helps the user to find the rate of the hacked (modified) content by fixing the probability level using the training data sets that are pre-defined by the user.

REFERENCES

[1] R.A. Ferreira, M.K. Ramanathan, A. Awan, A. Grama, and S. Jagannathan, "Search with Probabilistic Guarantees in Unstructured Peer-to-Peer Networks," Proc. IEEE Fifth Int'l Conf. Peer to Peer Computing (P2P '05), pp. 165-172, 2005.

[2] E. Cohen and S. Shenker, "Replication Strategies in Unstructured Peer-to-Peer Networks," Proc. ACM SIGCOMM '02. pp. 177-190, 2002.

[3] P. Reynolds and A. Vahdat, "Efficient Peer-to-Peer Keyword Searching," Proc. ACM/IFIP/USENIX 2003 Int'l Conf. Middleware (Middleware '03), pp. 21-40, 2003.

[4] H. Song, S. Dharmapurikar, J. Turner, and J. Lockwood, "Fast Hash Table Lookup Using Extended Bloom Filter: An Aid to Network Processing," Proc. ACM SIGCOMM, 2005.

[5] C. Tang and S. Dwarkadas, "Hybrid Global-Local Indexing for Effcient Peer-to-Peer Information Retrieval," Proc. First Conf. Symp. Networked Systems Design and Implementation (NSDI '04),p. 16, 2004.

[6] D. Li, J. Cao, X. Lu, and K. Chen, "Efficient Range Query Processing in Peer-to-Peer Systems," IEEE Trans. Knowledge and Data Eng., vol. 21, no. 1, pp. 78-91, Jan. 2008.

[7] G.S. Manku, "Routing Networks for Distributed Hash Tables," Proc. ACM 22nd Ann. Symp. Principles of Distributed Computing (PODC '03), pp. 133-142, 2003.

[8] H. Shen, Y. Shu, and B. Yu, "Efficient Semantic-Based Content Search in P2P Network," IEEE Trans. Knowledge and Data Eng.,vol. 16, no. 7, pp. 813-826, July 2004.

[9] A. Broder and M. Mitzenmacher, "Network Applications of Bloom Filters: A Survey," Internet Math., vol. 1, no. 4, pp. 485-509, 2004.

[10] V. King and J. Saia, "Choosing a Random Peer," Proc. ACM 23rd Ann. Symp. Principles of Distributed Computing (PODC '04), pp. 125-130, 2004.

[11] I. Stoica, R. Morris, D. Karger, M.F. Kaashoek, and H.Balakrishnan, "Chord: A Scalable Peer-to-Peer Lookup Service for Internet Applications," Proc. ACM SIGCOMM '01, pp. 149-160, 2001.

[12] C. Tang and S. Dwarkadas, "Hybrid Global-Local Indexing for Effcient Peer-to-Peer Information Retrieval," Proc. First Conf. Symp. Networked Systems Design and Implementation (NSDI '04), p. 16, 2004.

[13] F.M. Cuenca-Acuna, C. Peery, R.P. Martin, and T.D. Nguyen, "Planetp: Using Gossiping to Build Content Addressable Peer-to-Peer Information Sharing Communities," Proc. 12th IEEE Int'l Symp. High Performance Distributed Computing (HPDC '03), pp. 236-246, 2003.

[14] K. Sripanidkulchai, B. Maggs, and H. Zhang, "Efficient Content Location Using Interest-Based Locality in Peer-to- Peer Systems,"Proc. IEEE INFOCOM '03, 2003.

[15] M. Li, W.-C. Lee, A. Sivasubramaniam, and J. Zhao, "SSW: A Small-World-Based Overlay for Peer-to-Peer Search," IEEE Trans. Parallel and Distributed Systems, vol. 19, no. 6, pp. 735-749, June 2008.

Master-Slave Speed Control of Double Induction Motor

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ABSTRACT:

Induction motor is one of the main sources of mechanical energy in industry; several applications use more than one motor to bear the high load. This paper is concerned with the design of a master slave control system responsible for synchronization between the different motors. The concept of the field oriented control (foc) is explained. PI-field oriented controllers are designed for two induction motors in master slave configuration. The proposed control system is simulated using Matlab/Simulink. The simulation results showed good synchronization between the master and the slave motors with acceptable tracking error.

Keywords*: induction motor, synchronization problem, master-slave control, field oriented control (FOC).*

I. INTRODUCTION

Induction machine with drive systems are widely used in applications such as pumps, paper and textile mills, elevators, electric vehicle and subway transportation. Industrial drive applications are generally classified into constant-speed and variable-speed drives. Traditionally, AC machines have been used in constant-speed applications [1]. DC machines were preferred for variable-speed drives. Variable speed Induction Motor has been used widely for the industrial applications. Synchronization techniques can be implemented by using high efficiency induction motor. The Existing techniques used are Master-Slave, Cross Coupling Technique, and Bi-axial cross coupled control method [2]. Simulink model of an induction machine is described, and then this model is used in different drive applications, such as open-loop constant V/Hz control, indirect vector control, and master slave control [3-5].

In this work one of the motors has been used as a master and the other one as slave, the speed of the master motor represents a reference signal for a close loop control system that controls the speed of the slave motor to track the speed of the master. A control methodology for various models of the induction machine, including conventional control, is used to study and simulate the system using MATLAB software.

II. SYSTEM MODELING

Figure (1) shows the Simulink d^e-q^e model of the induction motor. The model receives the input voltages V_{qs} and V_{ds} and frequency ω_e and solves the output currents i_{qs} and i_{ds} with the help of flux linkage equations. Extensive discussion of this model was introduced in [6].

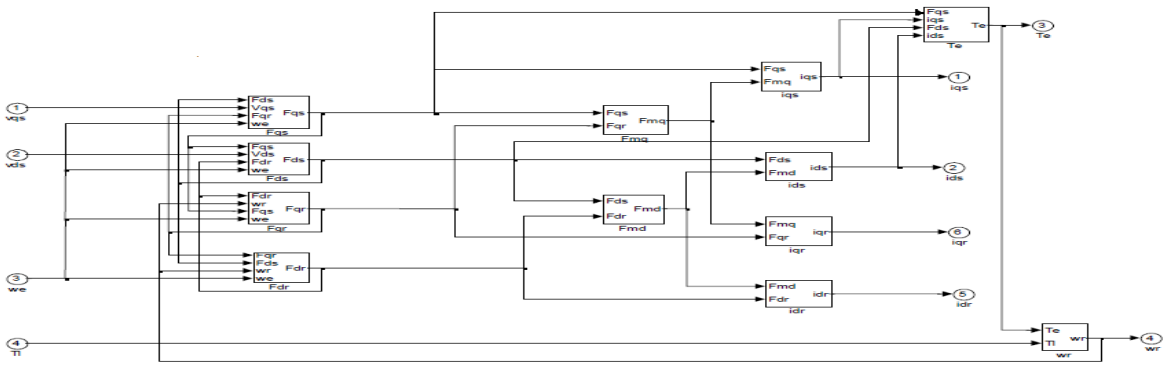


Figure (1) Induction Motor Model

Figure (2) shows the simple simulation block diagram for a three-phase, two-level PWM inverter. Each leg of the inverter is represented by a "switch" which has three input terminals and one output terminal. The output of a switch (v_{ao}, v_{bo}, or v_{co}) is connected to the upper input terminal (+0.5Vd) if the PWM control signal (middle input) is positive. Otherwise, the output is connected to the lower input terminal (-0.5Vd). Extensive discussion of this model was introduced in [7].

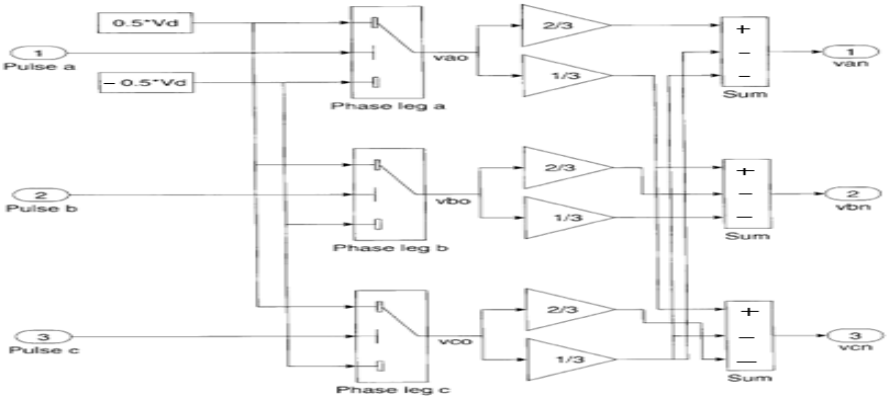


Figure 2 PWM Inverter Model

III. MASTER-SLAVE CONTROL TECHNIQUE

Master-Slave control technique is used for synchronization of double-motors. Its main characteristic is that the revolving speed output of the master motor is used as a reference value of the slave motor. Any input signal or disturbance on the master motor can be reflected and followed by the slave motor [8]. Figure (3) shows the adopted master salve configuration.

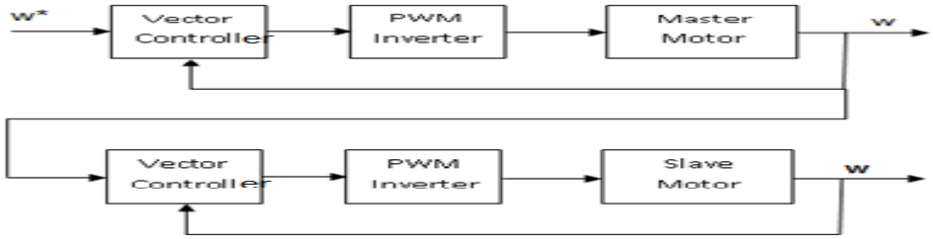
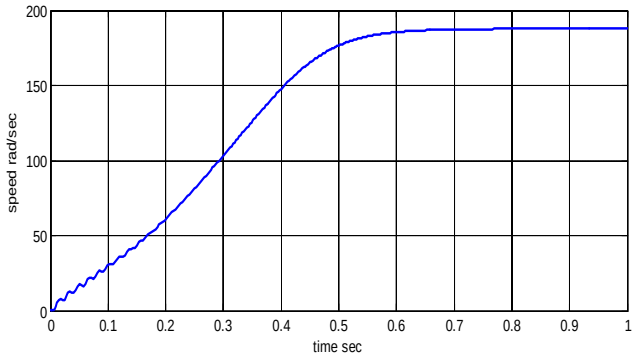


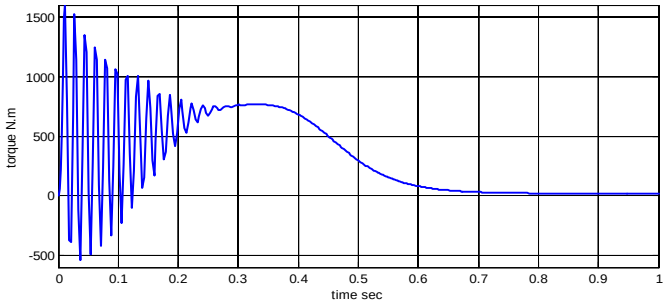
Figure 3 Master-slave Control Method

IV. SIMULATION RESULTS

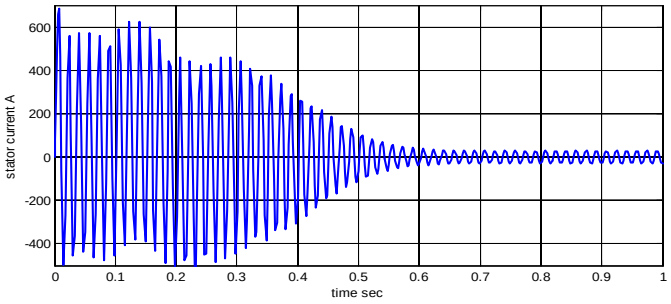
Direct start-up test of the model was done by applying a three-phase programmable voltage source with 460 volt, 60 Hz. The simulation of the dynamic speed, torque and stator current of the induction machine is shown in figure 4.



(a) Motor Speed



(b) Motor Torque



(c) Motor Stator Current

Figure 5 Induction Motor Dynamics using direct start-up test

In the indirect vector control the reference speed and the load torque applied to the motor shaft can be both selected by a manual switch block in order to use either a constant value or a step function. The simulation of indirect vector control of motor drive is shown in figure 6, as shown the system had poor transient response.

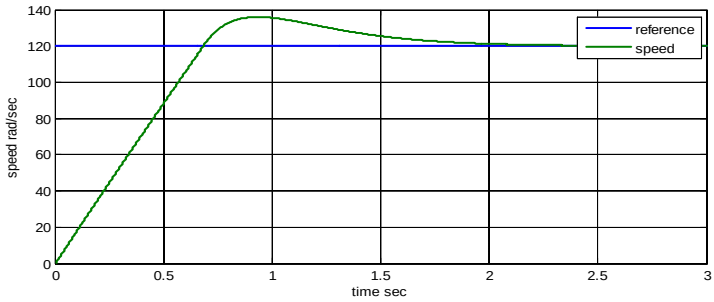


Figure 6 Speed of Motor Using Indirect Vector Control

The Simulink model of master-slave control was formed by combining a vector control block to the master motor, so that the master motor can operate at any desired speed as shown in figure 7. The simulation of master close loop system is shown in figure 8. It is obvious that the transient response is so good.

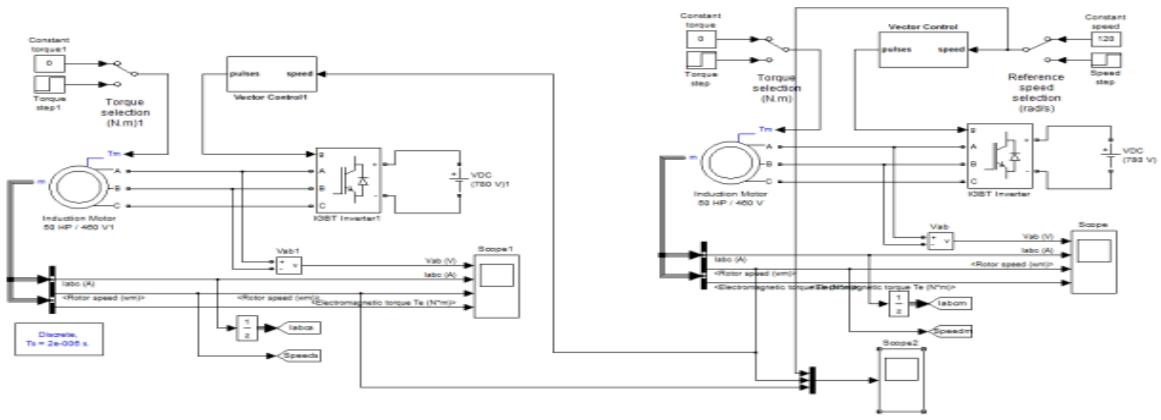
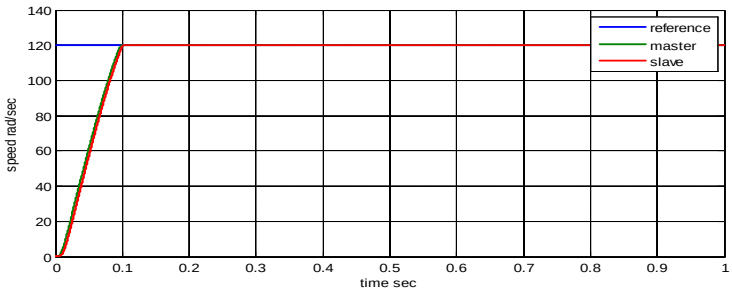
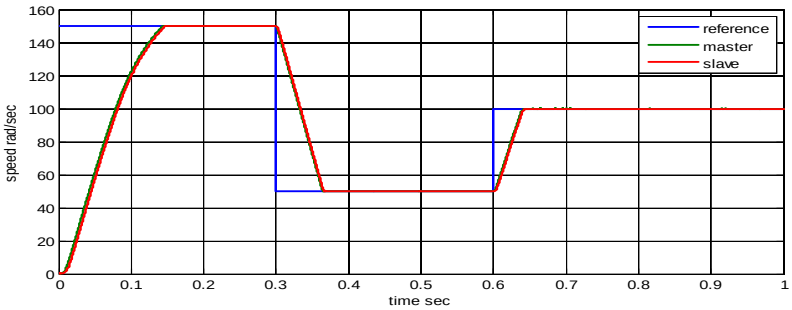


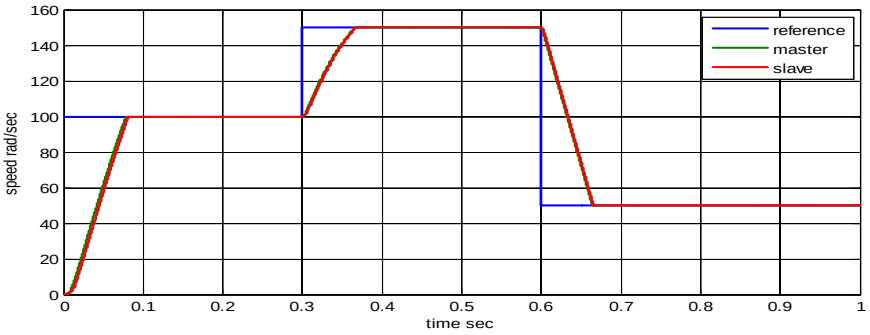
Figure 7: Simulink Model of Master-Slave Control



(a) Speed response in regulation mode



(b) Speed response tracking a variable reference (R1)



(a) Speed response tracking a variable reference (R2)

Figure 8 Speed Response of Master and Slave motors

V. CONCLUSIONS

In this paper all objectives are investigated, and master slave control is applied in the double induction motor synchronized system, which is so widely used in the industry. Master slave control strategy with FOC proves to be effective for synchronization of double-motor system with fast speed response, short setting time, stronger robustness and less overshoot. Such performance can hardly be achieved by traditional PI speed control.

REFERENCES

[1] R. G. Shriwastava, M.B.Diagavane, S.R.Vaishnav 2012"Literature Review of Permanent Magnet AC Motors Drive for Automotive Application" Bulletin of Electrical Engineering and Informatics), Vol.1, No.1, March 2012, pp. 7-14

[2] Aron van Zijl, "Master-Slave Motor Control", Eindhoven University of Technology Department of Electrical Engineering Group MBS, Measurement and Control Section.

[3] A A Ansari, D M Deshpande, "Mathematical Model of Asynchronous Machine in MATLAB Simulink" International Journal of Engineering Science and Technology Vol. 2(5), 2010, 1260-1267.

[4] Hoang Le-Huy "Modeling and Simulation of Electrical Drives using MATLAB/Simulink and Power System Block-set". IEcon'01: The 27th Annual Conference of the IEEE Industrial Electronics Society.

[5] M. SajediHir, Y. Hoseynpoor, P. MosadeghArdabili, T. PirzadehAshraf "Modeling and Simulation of Induction Motor Drive with Space Vector Control", Australian Journal of Basic and Applied Sciences, 5(9): 2210-2216, 2011 ISSN 1991-8178.

[6] Burak Ozpineci, Leon M. Tolbert "Simulink Implementation of Induction Machine Model– A Modular Approach" IEEE 2003, pp 728-734.

[7] Bimal K. Bose, "Modern Power Electronics and AC Drives", Prentice Hall, 2002.

[8] Biao YU, Hui ZHU and Chi XUE," Research on Adaptive Fuzzy PID Synchronous Control Strategy of Double-Motor", *I.J. Intelligent Systems and Applications*, 2011, 5, 28-33 Published Online August 2011 in MECS.

Cd-Hmm For Normal Sinus Rhythm

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ABSTRACT
To diagnose the cardiac abnormalities, it is important to detect and classify the cardiac arrhythmias. To achieve this we have to use the specialized program tools and visual demonstrations of new methods, as propagated by researcher from time to time. Our work is focused on classification of normal sinus rhythm and premature ventricular contractions of the human heart. We are using the wavelets for the feature selection and extraction (searching for a local maximum in the contour envelope successfully detects R-peaks) and Continuous Density Hidden Markov Models (CD-HMM) for the classification. The ECG data is taken from standard MIT-BIH arrhythmia database.

I. INTRODUCTION

The automatic processing systems are most frequently applied in medical domain as it is quite natural because modern medicine generates huge amounts of data, but at the same time there is often a lack of data analysis, classification and understanding. New methods can help in dealing with this problem; they can simplify and usually speed up the processing of large volumes of data. New algorithms work in time-frequency domain and combine some advantageous characteristics known from classical methods – mainly they allow frequency analysis with time information about analyzed features.

The automated detection and classification of cardiac arrhythmias is important for diagnosis of cardiac abnormalities. In practice, unsupervised methods may be required to detect arrhythmias in changing environment. Hidden Markov models are often used for such tasks in speech recognition but also in ECG processing. HMM can be combined with wavelet transform to obtain improved results [3].

Our work is focused upon the detection of premature ventricular contractions (PVC) among normal sinus rhythm (NSR). Premature ventricular contractions - these early depolarizations begin in the ventricle instead of the usual place, the sinus node. They are very
common, and are sometimes perceived as a palpitation. They often occur without the patient being aware of it at all. PVC's occure in bigeminy, trigeminy, quadrigeminy, ventricular tachycardia, ventricular fibrillation, etc.

An increased frequency of PVC's in patients with heart disease is statistically predictive of ventricular fibrillation and sudden death. In patients with some types of heart disease, PVC's or ventricular tachycardia do indicate an increased risk of serious arrhythmias. Therefore this work is focused on their detection.

II. METHODS

2.1 CONTINUOUS WAVELET TRANSFORM

In the proposed method, input data were transformed by continuous wavelet transform (CWT):

CWT(a,b) =

$$\frac{1}{\sqrt{a}} \int_{-\infty}^{\infty} \left(\frac{t-b}{a} \right) f(t)dt$$

where *a* is a scale and *b* is a time shift. Time-frequency spectrum enables to measure time-frequency changes in spectral components. Interpretation of a time-frequency resolution by CWT is as follows: CWT represents time-frequency decomposition realized by correlation of signal *f*(*t*) with basic functions derived from the mother wave ψ(*t*). Haar function was used as the mother wavelet for its simplicity:

$$\begin{cases} 1 & 0 \le t < \frac{1}{2} \\ -1 & \frac{1}{2} \le t < 1 \\ 0 & \text{others}, \end{cases} \qquad (2)$$

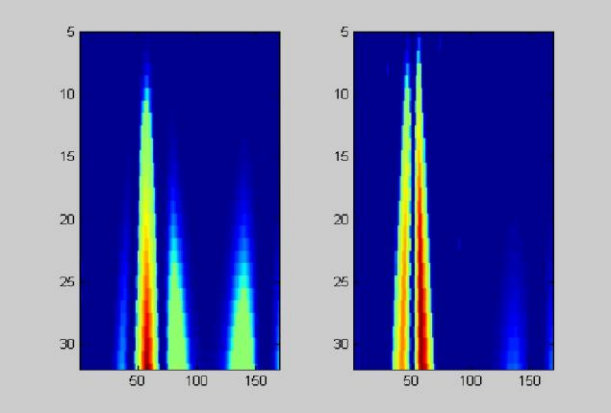

Fig. 1: *Continuous wavelet transform of the raw time data series (left panel – premature ventricular contraction, right panel – normal sinus rhythm).*

Scales were finally chosen from an interval of <1; 40>. The signals were extracted as periods of 250 samples (f_s=360 Hz) containing R-waves of each QRS complex. After transforming by CWT, the wavelet coefficients were squared and normalized.

2.2 Continuous Density Hidden Markov Model (Cd-Hmm)

The Hidden Markov model is a finite state machine having a set of states Q, each of which is associated with probability distribution, an output alphabet O, transition probabilities A, output probabilities B, and initial state probabilities **Π**. The current state is not observable. Instead, each state produces an output with a certain probability B. The CD-HMM stage is proceeded by the pre-processing step (CWT).

Continuous emission probability $B = \{b_j(O_t)\}$, where $O = O_1, O_2, \ldots, O_T$, the emission probability density function of each state is defined by a finite multivariate Gaussian mixture:

$$b_j(O_t) = \sum_{M=1}^{M} d_{jm} N(O_t, \mu_{jm}, C_{jm}), \qquad 1 \le j \le N \qquad (3)$$

where O_t is the feature vector of the sequence being modelled, d_{jm} is the mixture coefficient from the mth mixture in state j and N is a Gaussian probability with mean vector μ_{jm} and covariance matrix C_{jm} for the mth mixture component in state j. We will refer to these models as a continuous density HMM (CD-HMM).

The used CD-HMM had left-to-right topology. The number of states is possible to change. The first state is designated as the initial state and the last state as the output state.

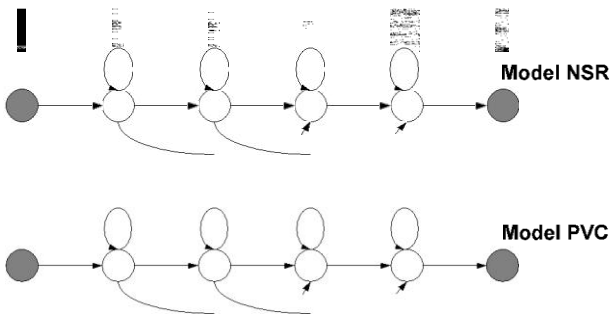

Fig. 2: *Structure of the used hidden Markov model.*

Initial transition probability A (for example for 10 state model) is:

$$A= \begin{bmatrix} 0100000000 \\ 00.330.330.33000000 \\ 00.330.330.3300000 \\ \dots \\ 0000000000 \end{bmatrix}$$

Three problems are considered as fundamental in hidden Markov modelling applications:

1) Estimation of hidden Markov model parameters from a set of representative training data (parameters include state transition probabilities, output probabilities).

2) Efficient calculation of P (O|□)- the probability that a given observation sequence was generated by a particular hidden Markov model □ .

3) Determination of X*, the most likely underlying state sequence corresponding to a given observation sequence 0 such that P (0| X*,□) is maximum.

The importance of solving the first problem is obvious; model parameters must first be estimated before the models can be used for classification purposes.

Baum-Welch algorithm was used as a training method to find hidden Markov model parameters A, B with the maximum likelihood of generating the given symbol sequence in the observation vector.

The probability of state occupation must be calculated. This is done efficiently using the so-called Forward-Backward algorithm.

The solution to the second problem is often used as the basis for a classification system. By computing P (O|□) for each of*i* possible models and choosing the most likely model, classification can be inferred.

An alternative classification approach uses the solution of the third problem to find the single best state sequence which maximizes P (0| X*,□). Classification can then be inferred by choosing the model with the most likely best state sequence, which requires less computation than determining the most likely model.

The logarithmic Viterbi algorithm was used for the recognizing. It determines the most probable route to the next state, and remembers how to get there. This is done by considering all products of transition probabilities with the maximal probabilities already derived for the preceding step. The largest such is remembered, together with what provoked it.

Scaling the computation of Viterbi algorithm to avoid underflow is non-trivial. However, by simply computing of the logarithm it is possible to avoid any numerical problems.

III. RESULTS

The proposed method was used in an educational graphical program in Matlab environment. The program allows selection of a number of states and initial transition probabilities of the HMM model. After the reading of signals, students can visually follow whole classification process. They can also see results of the wavelet transform of the signal and the training process. They can compare results of the classification using transformed and raw ECG data.

The ECG data were taken from the standard MIT-BIH arrhythmia database automatically as a sequence of 250 samples (100 samples before R-waves and 150 after the R-waves. Graphical interface of the realized program is depicted on Fig.3.

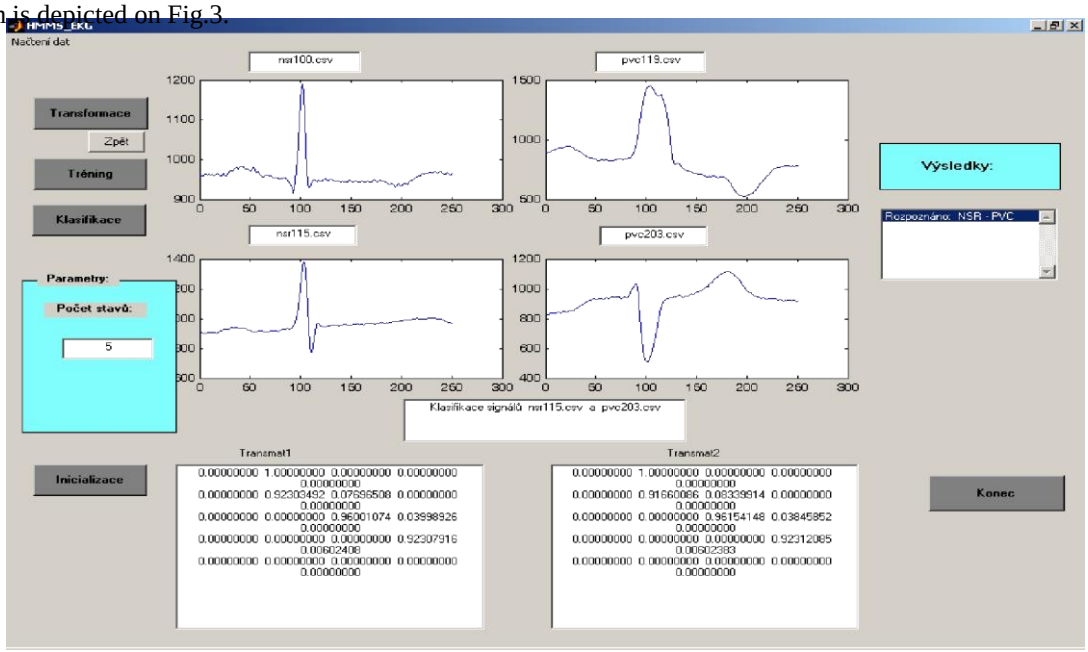

Fig. 3: *Custom-made program tool interface*

IV. CONCLUSSION

An algorithm employs unsupervised way of the classification. Our work is focused on classification of normal sinus rhythm and premature ventricular contractions. It is demonstrated that wavelet methods can be used to generate an encoding of the ECG which is tuned to the unique spectral characteristics of the ECG waveform features. Left-to-right CD-HMM was used.

REFERENCES

[1] Kičmerová, D.: Detection and classification of ECG signals in time-frequency domain. Diploma Thesis. Brno University of Technology, 2004.

[2] Rabiner, L R.: A tutorial on hidden Markov models and selected applications in speech recognition. Proceedings of the IEEE, 77(2):257–286 , 1989.

[3] Bardoňová, J., Provazník, I., Nováková, M., Nováková,HiddenZ.: Markov model in wavelet analysis of myocardial ischemia in rabbit. In Computers in Cardiology, p. 419– 422, Boston, 2000.

Develop A Electricity Utility Network Using GIS

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ABSTRACT:
GIS is a growing discipline in the field of information technology and is providing better solutions for the representation of the geographical data. Basically GIS means "A system for capturing, storing, checking, integrating, manipulating, analysing and displaying data which are spatially referenced to the Earth. This is normally considered to involve a spatially referenced computer database and appropriate applications software". ***The main objective of this paper is to Develop a Electricity utility Network Using GIS.*** *The problem statement are following*

- *Difficulty in fault management : time consuming and man power consuming.*
- *Frequent thefts of electricity in current system.*
- *Inefficient supply of electricity.*

Unsystematic network expansion.
The geographical data is used for the purpose of studying and analyzing the current situation of any geographical region so that other aspects can also be analyzed surrounding that region, which may or may not be included in the attribute data. Hence it is being incorporated in different fields of research and analysis. In the field of managing electric power transmission and distribution GIS plays a strong role for both traditional and smart grid networks. when smart grid is applied over the electric network that time managing data using GIS becomes essential.
EGIS(Electric network geographic system) provides some important functionalities just like as

- *Show complete network distribution system of area.*
- *Information about the Main power distribution centers and the sub power stations in local area.*
- *Information about the every pole located in the area and the connections supplied from that pole.*
- *Information about the connections supplied from the transformers located in particular colonies.*

Key Words*: Geoserver, Arcgis, Autocad, SQL server, map(information), wireless toolkit.*

I. INTRODUCTION

The spectacular growth of the use of digital Geoinformation in parallel with the advances in Information Technology (IT), collecting in-situ data have been dramatically improved using handheld devices. This practice was being made by hand with paper and then manually entered into Geographic Information System (GIS) databases once in the office, which is time-consuming. Traditionally, collecting and using data in the field was a paper-based process with multiple points of data entry without accessing to real-time information. The processes of field data collection and editing have been time consuming. Geographic data has traveled into the field in the form of paper maps. Field edits were performed using sketches and notes on paper maps and forms. Once back in the office, these field edits were deciphered and manually entered into the GIS database [1]. The result has been that GIS data has often not been as up-to-date or accurate as it could have been. ESRI's developments in mobile GIS have enabled GIS to be taken into the field as digital maps on compact, systems providing field access to enterprise geographic information. This enables organizations to add real-time information to their database and applications, speeding up analysis, display, and decision making by using up-to-date, more accurate spatial data. Firefighters, police officers, engineering crews, surveyors, utility workers, soldiers, census workers, field biologists, and others, use E- GIS to complete the following tasks:

- **Field Mapping—**Create, edit, and use GIS maps in the field.
- **Asset Inventories—**Create and maintain an inventory of asset locations and attribute information.
- **Asset Maintenance—**Update asset location and condition and schedule maintenance.

- **Inspections**—maintain digital records and locations of field assets for legal code compliance and ticketing.

EGIS(Electric network geographic system) provides the utility company with the ability to monitor smart grid networks and perform queries concerning the network health. The system can display the complete network and highlight assets that have changed or that are malfunctioned. When projecting this feature upon the whole network it becomes clear that EGIS can show the entire state of the grid in an easy-to-understand realistic model.

EGIS(Electric network geographic system) is a complementary partner when transitioning to smart grid networks that can contribute in the conversion of the grid from a passive system to an intelligent interactive one. Utilities can monitor the construction progress, efficiently route crews and most importantly, provide the best analysis for the optimum location for repeaters, sensors, and new communication backbones.
GIS is a growing discipline in the field of information technology and is providing better solutions for the representation of the geographical data. Basically GIS means "A system for capturing, storing, checking, integrating, manipulating, analysing and displaying data which are spatially referenced to the Earth. This is normally considered to involve a spatially referenced computer database and appropriate applications software"[2].

GIS is playing a vital role in the field of planning and analysis with respect to the geographically organized demographic information to improve decision making (Asia Pacific, The monthly magazine on Geographic Information Science, December 2006), as:

- Site Location Analysis
- Target Marketing.
- Consumer Potential.

The GIS system can help identify how many electric poles are in your electric system and detailed information about each electric pole.
For example: age of pole, height of pole, if a street light is on the pole, number of transformers attached to a specific electric pole if any, and the size of the transformer, etc.

II. COMPONENT OF E-GIS

A working Geographic Information System seamlessly integrates five key components: These are hardware, software, data, people, and method.

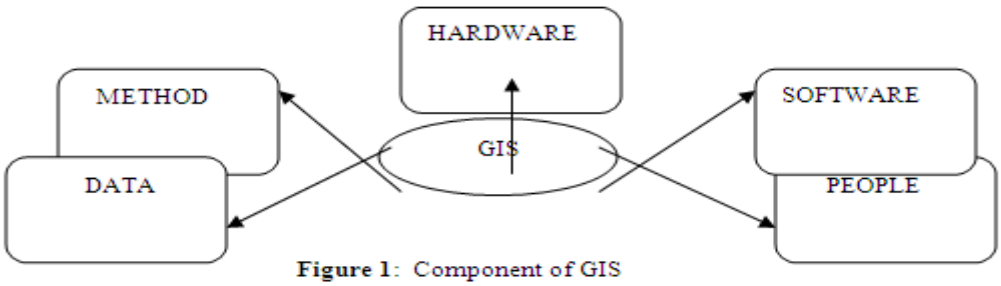


Figure 1: Component of GIS

- **HARDWARE**

Hardware includes the computer on which a GIS operates the monitor on which results are displayed, and a printer for making hard copies of the results. Today, GIS software runs on a wide range of hardware types, from centralized computer servers to desktop computers used in stand-alone or networked configurations. The data files used in GIS are relatively large, so the computer must have a fast processing speed and a large hard drive capable of saving many files.

- **SOFTWARE**

GIS software provides the functions and tools needed to store, analyze, and display geographic information. Key software components include tools for the input and manipulation of geographic information, a database management system (DBMS), tools that support geographic query, analysis, and visualization, and a graphical user interface (GUI) for easy access to tools. The industry leader is ARC/INFO, produced by Environmental Systems Research, Inc. The same company produces a more accessible product, Arc View that is similar to ARCINFO in many ways[3].

- **DATA**

Possibly the most important component of a GIS is the data. A GIS will integrate spatial data with other data resources and can even use a database management system, used by most organizations to organize and maintain their data, to manage spatial data. There are three ways to obtain the data to be used in a GIS. Geographic data and related tabular data can be collected in-house or produced by digitizing images from aerial photographs or published maps.

- **PEOPLE**

GIS users range from technical specialists who design and maintain the system to those who use it to help them perform their everyday work. The basic techniques of GIS are simple enough to master that even students in elementary schools are learning to use GIS. Because the technology is used in so many ways, experienced GIS users have a tremendous advantage in today's job market

- **METHOD**

A successful GIS operates according to a well-designed plan and business rules, which are the models and operating practices unique to each organization[4].

Application of GIS

For several years, new geographical and urban applications have been emerging in which characteristics of communications and real time have been very important. We are facing a new discipline called telegeomonitoring which can be considered as a discipline characterized by positioning systems, cartography, the exchange of information between different sites and real time spatial decision making [5]

- Utility : Water supply, electricity supply etc.
- Agriculture
- Defence and security
- Infrastructure

III. METHODOLOGY

3.1Detailed planning

Creation of network

A Utility Geographic Information System (GIS) combines digital maps and data to enhance the quality. Data Collection - Provides a way to convert data from several sources such as paper maps, AutoCad files, information stored in people's heads and new data collected in the field into a common digital and map based format. Firstly we create a network map of HIGH TENTION LINE, LOW TENTION LINE, pole, transformer, grid etc on paper as per requirement through pencil. This network map is scanned by the scanner and this scanned map is deployed on Arcgis software and all coordinate system is adopted through Arcgis.
Preparing Shape file using ARC GIS. The different layer that are prepared using this software are
a. Electric Pole Layer,
b. LT electric line Layer, and
c. HT electric line Layer etc.
The approach is defined by the following below flowchart in section. This flowchart indicates the process of work been carried out.

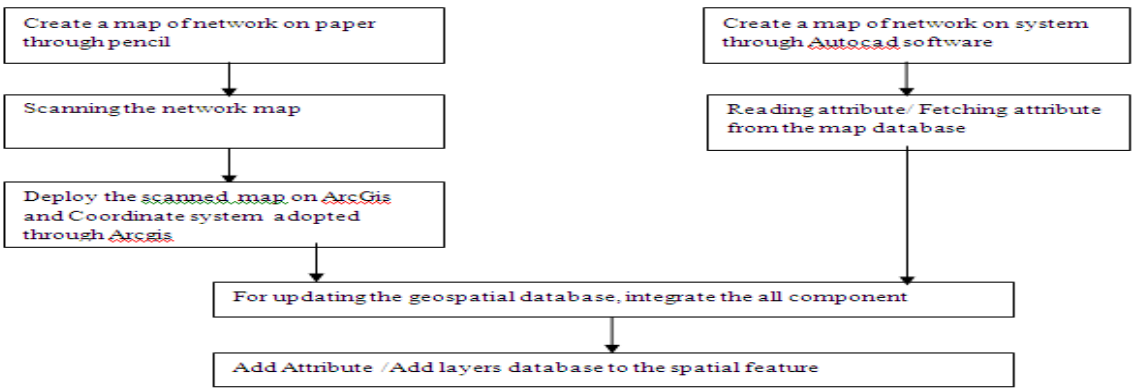


Figure 2: Creation of Geospatial Database

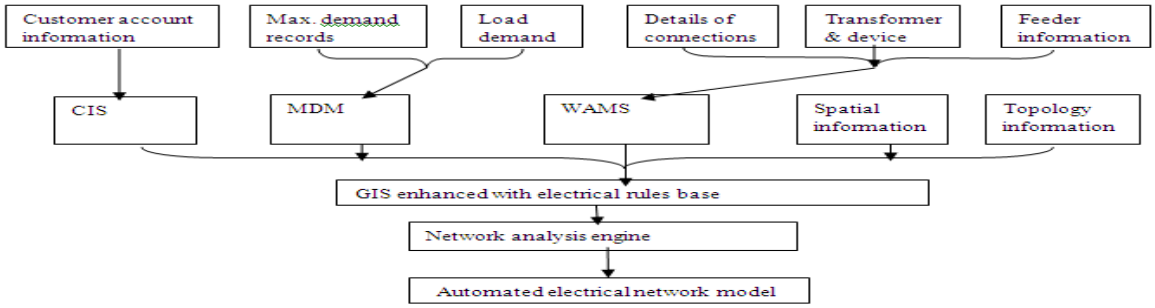


Figure 3: overall methodology

Expectations of Electricity Utility

- Improving 'Customer Complaints' logs in Trouble call Management.
- Long Standing faults brought to minimum.
- To Stop Power theft.
- To Provide better services to the consumers.
- To reduce Outage time.
- Good collection & billing System.
- Limiting number of interruption per day a) Breakdown b) Preventive Maintenance c) Load-shedding.

SNAPSHOTS OF WORKING APPLICATION

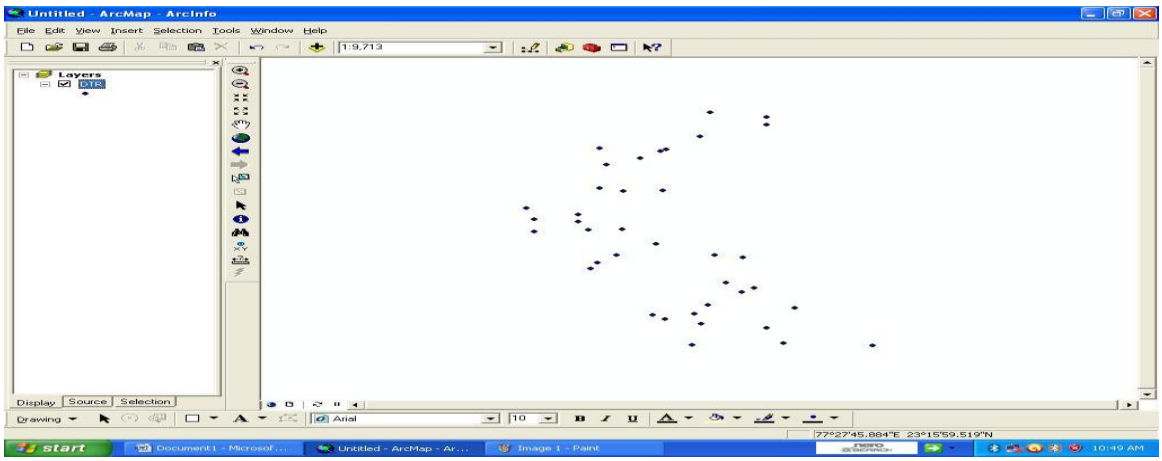
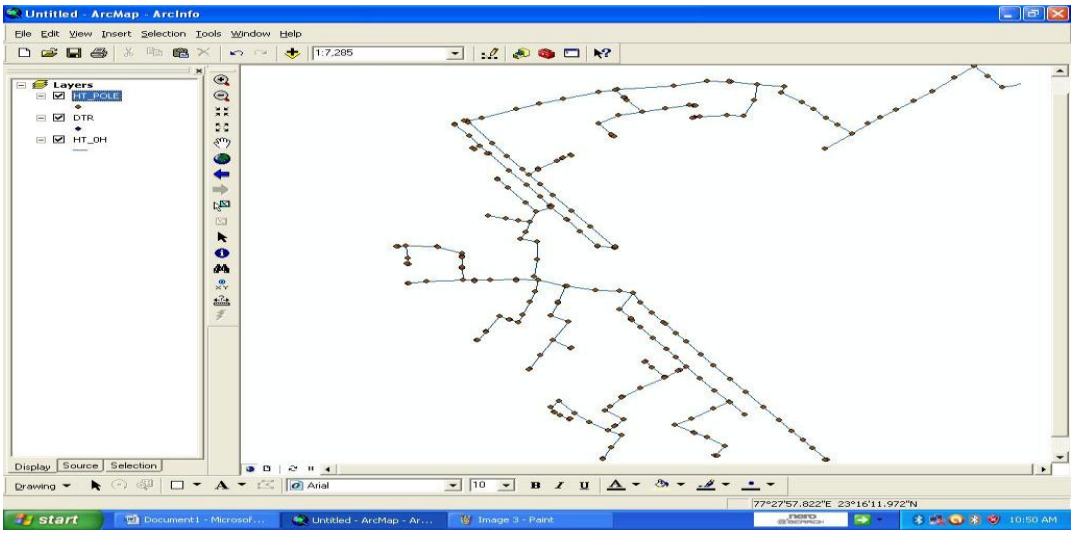


Figure 4: creation of network of pole



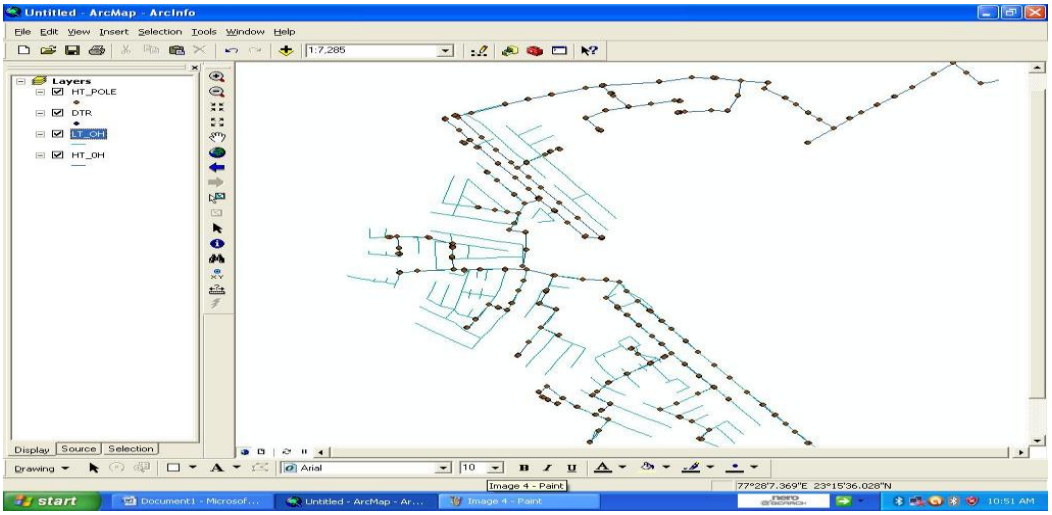
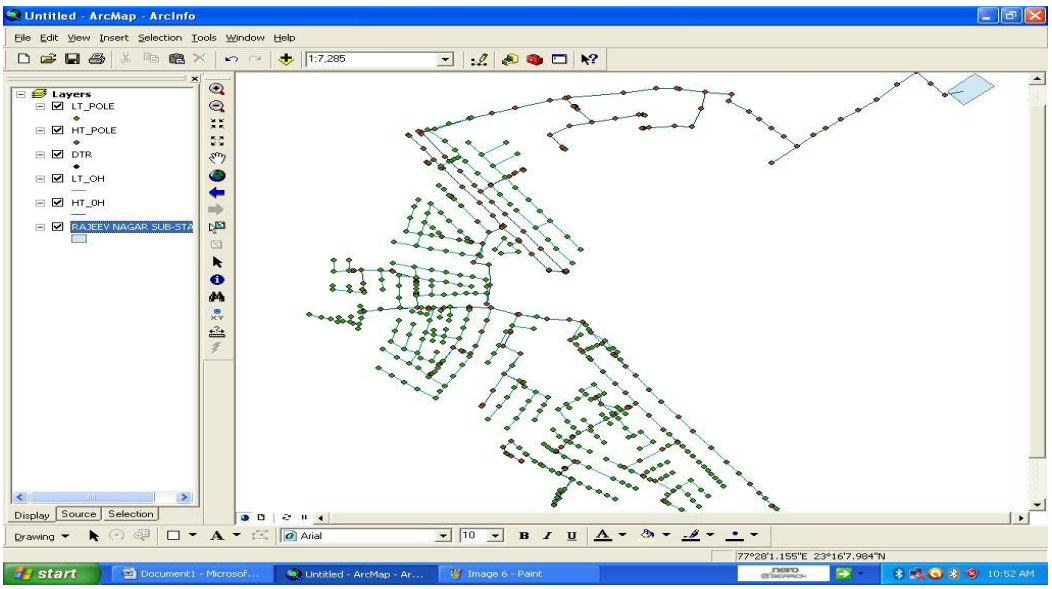


Figure 5: (a) creation of HT (main) line. (b) creation of LT line



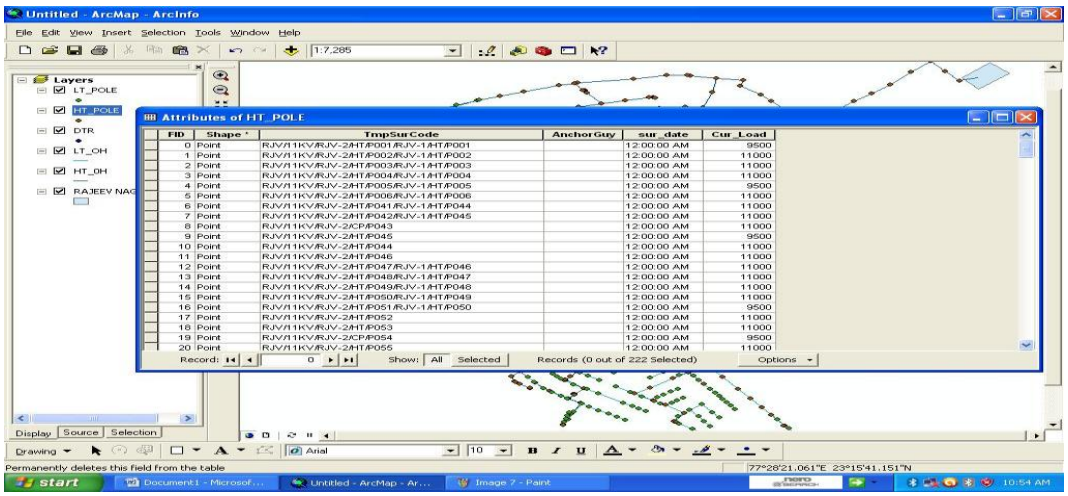


Figure 6: (a) Connection to the grid and distribution of electricity. (b) creation of database

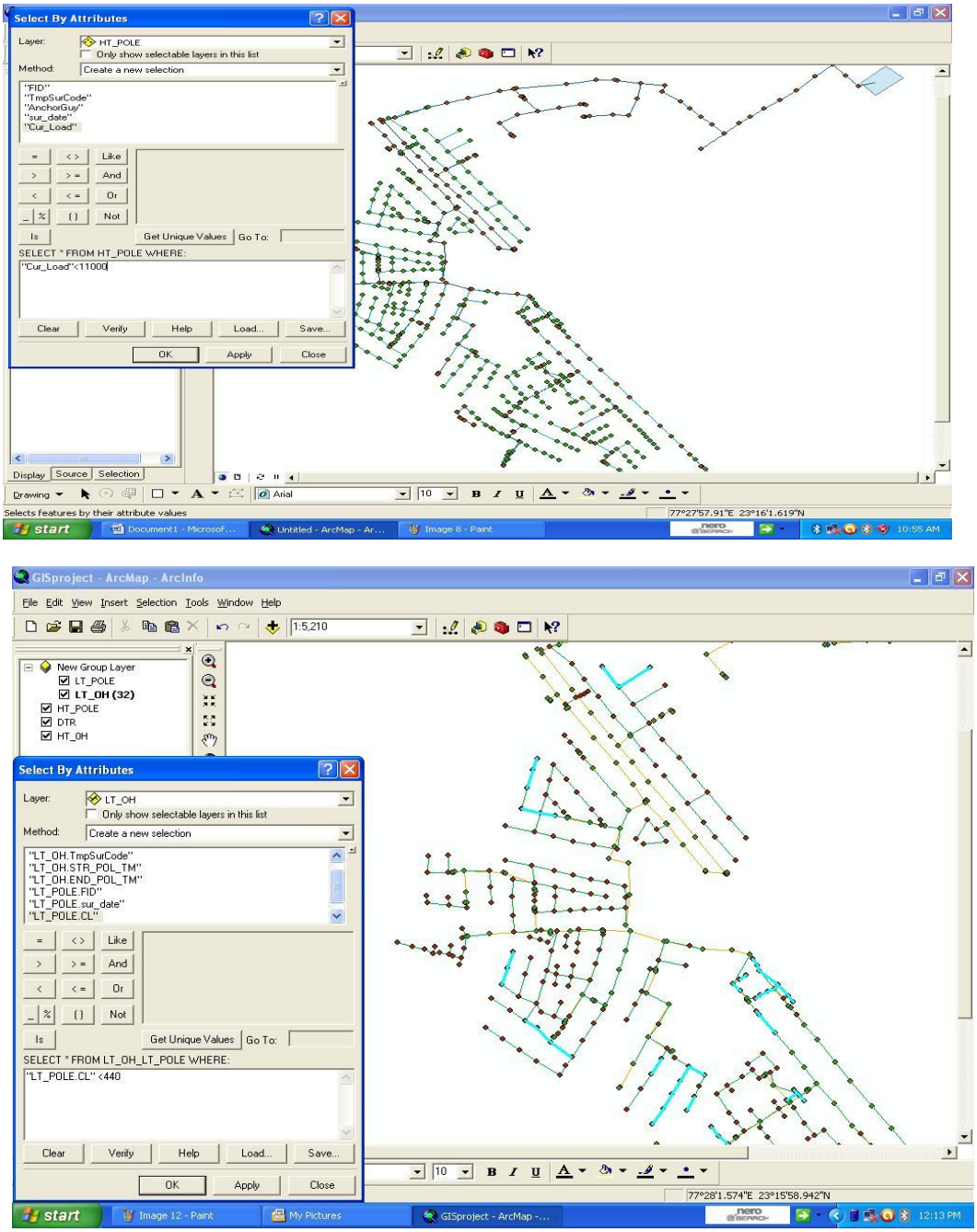


Figure 7: (a) Adding Attribute Name or layers. (b) Complete view of electric utility network after updating.

IV. CONCLUSION

A Electric-GIS enables field-based personnel to capture, store, update, manipulate, analyze, and display geographic information directly in the field. The main purpose of this paper is to develop a Electric-GIS application which supports a functionality such as to create a network of electric utility. It Show complete network distribution system of area, Information about the Main power distribution centers, Information about the sub power stations in local area , Information about the every pole located in the area and the connections supplied from that pole, Information about the connections supplied from the transformers located in particular colonies, Information about the Local power lines which lying in the local area and Information about the Main power line coming from the main station. It also helps to Improving 'Customer Complaints' logs in Trouble call Management, Long Standing faults brought to minimum, to Stop Power theft, and to Provide better services to the consumers.

REFERENCES

[1] Maruto Masserie Sardadi, "Quadtree Spatial Indexing Use to Make Faster Showing Geographical Map in Mobile Geographical Information System Technology Using an Oracle 10g Application Server and Map Viewer Applications,", IJCSNS International Journal of Computer Science and Network Security, 2008.

[2] E.Poorazizi, "Developing a Mobile GIS for Field Geospatial data Acquisition,". A.A.Alesheikh and S.Behzadi, Ed. Asian Network for Scientific Information: Journal of Applied Sciences, 2008.

[3] Huajun Chen, Keyan Xiao "The Design and Implementation of the Geological Data Acquisition System Based on Mobile GIS"School of Geoscience Yangtze University, Jingzhou, China,2011.

[4] E.Poorazizi, "Developing a Mobile GIS for Field Geospatial data Acquisition,". A.A.Alesheikh and S.Behzadi, Ed. Asian Network for Scientific Information: Journal of Applied Sciences, 2008.

[5] Justin Deoliveira "GeoServer: Uniting the "GeoWeb" and Spatial Data Infrastructures",2009.

Implementing CURE to Address Scalability Issue in Social Media

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ABSTRACT:
This paper presents a behavior of individuals from an collective behavior using a social-dimension based approach. Collective behavior, which indicates the group of data generated on a large scale, such as facebook, orkut, twitter etc. which generates a large amount of data on large scale and provides a way to act as a platform for targeting an actor's behavior involved on to them. Thus, we consider an place of social media network to choose an application for applying our work on to them. Social media network activities which includes millions of actors behaviors involved onto it in fraction of second. To predict these behaviors, we propose an edge centric clustering schema to extract social dimensions from a network. Although, there are many extracting schemes to extract social dimensions, their scalability paves the way to lack to guarantee in finding dimensions effectively and efficiently. Edge centric clustering schema with CURE algorithm solves the scalability issue that occurs in previous schemas and provides efficient and effective extraction of social dimensions. If the process implementation completed, the performance results using social media network shows that our cost included in CURE with edge centric scheme is being less than one third the cost required by existing schemas. The effectiveness of edge centric clustering schema is demonstrated by experiments conducted on various data and by comparison with existing clustering methods.

Keywords: *actors, collective behavior, CURE, scalability*

I. INTRODUCTION

The rapid advance of social media actors and the communication involved to them leads to a traffic control aspect and also a difficulty in tracing a particular actor involved in an social media and on background, the uninvolved actors to the target can also to be easily identified by using our latest techniques to be processed on once to it. Here we consider a facebook, orkut as shown in Table 1 as an example for social media networks and we works on over through to it to achieve the expected target to be traced on the network by calculating the affiliation of the actors with the weights that we have achieved on manual analysis through the way of analysis algorithm CURE to be implemented on the network. There are millions of actors and their behaviors are running and updating on a social media network (facebook, orkut) for a fraction of second. With the variation of this fraction of second, we have to trace a target behavior and their behavioral relationship with the unobserved individuals in the network.

Table 1. Affiliations identification

Actors	Facebook	Orkut
1	0	1
2	0.5	o.3
3	1	0
4	0.5	1
5	1	0.8

Table 1 shows the 5 types of actors that they have involved in a social media network such as facebook, orkut. The actor 1 has been only affiliated to orkut with the weighting factor of 1 whereas, the actor 2 affiliated to both facebook and orkut with the weighting factor of 0.5 and 0.3. the actor 3 has been only affiliated to facebook with 1. The actor 4 and actor 5 affiliated to both facebook and orkut with the weighting factor (0.5, 1) and (1, 0.8). Thus, through this analysis based upon affiliation give clear overview for the behavior of observed and unobserved individuals in a network.

In consideration with the social media network, the various parameters have to be taken for the process of analyzing. Clustering plays a major role in the phenomenon due to the actor analysis process based on their community involved in the network or its communication with its friends or colleagues on the running time in media and these updating have been simultaneously going through in the concerned media. As with millions of updating, we are going to search through the particular actors behavior in the network and their perceptions can also be overviewed, there we come across an most regarded features such as observed individuals and unobserved individuals. The term unobserved individuals which indicates the actors behavior concerned to them but they are not belong to same community or network and they may belong to some other network and these individuals are not being our target, we collect the behavior of individuals due to an target actors communication with these individuals on an notification process. Thus, the clustering concept which divides the common community or common network people into one cluster and the other network people, who does not belongs to target actor network are grouped into some other cluster. Thus, the classification does its work followed by clustering in the network.

Clustering Using Representatives (CURE), which involves its action with the constant number of representative points have been selected to represent or to form a cluster. The selected number of points is to play a role of parameters. The similarities are to be identified as a affiliation by the similarity of an neighbor pair of selected points that represents to various kinds of clusters. Fig. 1 shows the network of 9 actors to be included onto it. The targeted actor name considered to be V and how V performs affiliations and its behavior are to be traced based on the edge centric clustering schema. The edge partition deals with the status 1 and 0 for its behavioral connections simultaneously to his friends, family, school mates, college mates and office colleagues.

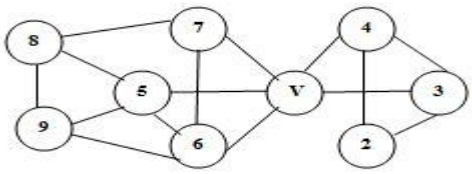

Figure 1. An actor V example

Table 2. Dimensional representation of the V example

Actors	Edge Partition
1	1 1
2	1 0
3	1 0
4	1 0
5	0 1
6	0 1
7	0 1
8	0 1
9	0 1

Table 2 gives the clear overview of an edge partition pattern for the 9 actors involved in a media network. The target V is to be affiliated to both facebook and orkut as analysed by the edge partition with the status 1, whereas other actors plays its behavior to be either facebook or orkut with the status either (1,0) or (0,1) in the edge partition. If the actors are to be in count of millions and their related observations or communications with the other actors or unobserved individuals can easily be extracted by using the edge partition notification corresponding to the communication involved on to them on social media.

II. RELATED WORK

The work related to finding the behavior of individuals with the unobserved individuals behavior in social media of same network are to be followed.

J.Hopcraft and R.Tarjan [1] have introduced the biconnectivity components for a care of edges to be involved. Bicomponents are similar to edge cluster, it also at first separates the concerned edges into disjoint sets for extraction. Lei Tang, Xufei Wang and Huan Lie [2] have proposed the k-means clustering analysis to the edge centric view to find a similarity with the same network or with the different clusters. K-means which deals with the k class labels with the centroid of cluster, then computes $Sim(i,c_j)$, then checks the condition

$$Sim(i,c_j) > maxSim_i \quad (1)$$

If it possible, then update the action of centroid until the value of objective have been changed over the network. M.McPharson, L.Smith-Lovin and J.M.Cook [3] deals with the concept of homophily, which includes the motivation of link with one another rather than test results in correlations between connections involved. Homophily are very much interested to connect to other in the network with the similarity of an actor. Homophily the term is very popular in the online systems extraction.K.Yu, S.Yu and V.Tresp [6] deals with the probabilistic method because for an aspect of finding the actor behavior with relation to same or different network. R.-E. Fan and C.-J. Lin [9] considers a concept of threshold identification for the aspect of finding similarities that have been tied up. T.Evan and R.Lambiotte [7] proposed a graph related algorithms which constructs the line graph or the basic graph partitioning representation, then they have been followed by a graph partitioning algorithms instead of an edge partition in an clusters but it fails in an mark up scalable liability aspect.M.Newman [4], [5] proposed a various kinds of techniques for an aspect of best evaluation report. He describes a maximum likelihood estimation aspect with the power law degree distribution done on it. Another kind of technique he proposed was modularity maximizatioin, which extracts social dimension with the relational learning methods. Modmax tends to capture the affiliations of the actors on the social network connectivity with their regarding dimensions to be notifies and represented for extraction. S.Gregory [10] tries in extending Newman-Girvan methods for an aspect of solving the overlapping communities in annetwok. F.Harary et al. [13] noticed a line graph for an analysis aspect.X.Zhu et al. [11], [12] deals with the semi supervised learning and label propagation for a detection of individuals behavior in a social-media network with the relevant information. Semi supervised learning which has its differential aspect when compared it with the relational learning and proves its efficiency towards the relational aspect in the process of action involved in the extraction aspect. S.A.Macskassy and F.Provost proposes a collective inference method to solve the problem of identifying a actor in an network but achievement in the scalability are not considered to be up to level.

III. OUR PROPOSAL

3.1. Architecture

To achieve the scalability factor, we design a system with the example of social media on targeting some actor at first, with the relevant information to be given. Thus, the 2 media of facebook and orkut, which generates oceans of data in a second corresponding to the actor with the observed individuals, the unobserved individuals are to be traced out either in the same network or in the some other media network.

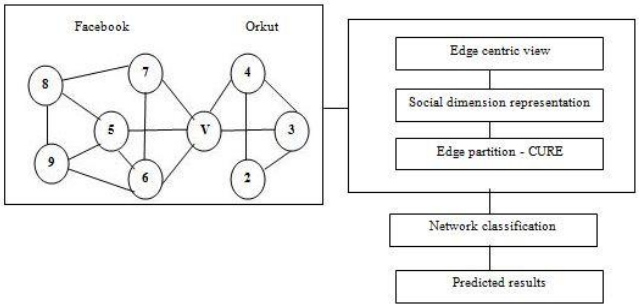

Figure 2. System architecture

Fig. 2 shows the system architecture to collect a behavior of an actor with the scalable manner. First the system starts with 9 actors involved in the facebook and orkut with 5 actors in facebook and 4 actors in orkut, whereas V actor target is communicating with the actors in the same network and also actors in the orkut. To find these coinciding factors, we undergo a network or convert a network into an edge centric view. The edge centric view which identifies edge of an network corresponding to target. Then, the social-dimension representations are to be noted with the selected number of points that we takes. As last, in the schematic factor edge partition are to be calculated with the analysis algorithm of CURE. It has been represented with the status 1 and 0, 1 indicates the communication to be positive, failure are represented as 0. Then the network classification to train a classifier with the expanding dataset has to be done based on selection of classifier corresponding to the defined network. As followed by classification predicted results has been noted in the scalable manner.

3.2. Edge Centric Clustering Scheme by CURE

CURE algorithm, which has its constant number of representative points to represent a cluster rather than a single centroid. With the edge centric clustering scheme it performs the action of extracting a target behavior with the scalability aspect applicable to a forming cluster. CURE algorithm forms a C cluster basis from the group then with C clusters it calculates the analysis factors for the extraction purpose of an target actor given as input to the extractor to extract the collective behavior from the network connectivity considered such as here we takes thefacebook and orkut as an example for the actor behavior to extract.

Table 3: The proposed schema

Clustering
Network converted into edge centric view Edge Partitions to be done C clusters are identified with training and testing sets
Expansion
C clusters are taken $C(i) = \begin{cases} 1 \text{ if } af(i) > 1 \text{ and } (1-af(i)/N) > 1 \\ \text{else} \end{cases}$ $C(i) = 0$ Expanded training and testing sets defined
Classification
Based on type of network, classifier identified to example of training and testing sets Results predicted with scalable aspects

We classify the process into 3 categories viz, clustering, expansion and classification. In the aspect of clustering concept, at first the network are to be converted into edge centric view. Then the edge partition has to be calculated with clustering algorithm called CURE. C clusters are identified with the training and testing sets. Whereas expansion, find the metric to describe the training sets and testing sets to an aspect of classification. In classification based on the consideration of network, classification identifies the example of training sets and testing sets. As last, results are predicted for an actor behavior in a social media.

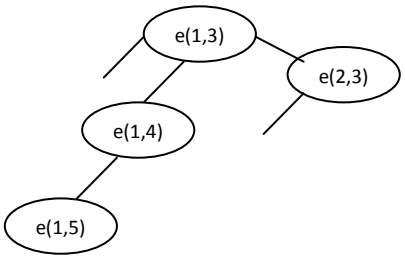

Figure 3. Example for line graph

Edge centric clustering scheme go through the blogcatalog and photosite for the updation of actors or communication of actors to the other actors or people in the social media. Fig. 3 shows how the line graph has been framed from network to find the edges for an aspect of partitioning the actor based on their behavior. Here, the graph paves the way for edge instances to be referred as given in Table 4, which is with the mentioning of status 1 and 0, as discussed earlier their status 1 refers to the positive attribute act and the status 0 refers to the negative aspect in the edges consideration to the social media network are to be useful for CURE algorithm for the purpose of analyzing factor, which analyses the both observed and unobserved individuals in the social medianetwork related to the given input as target to trace on the network.

Table 4: Edge instances

Edge	**Features** **1 2 3 4 5 6 7**
e(1,3)	**1 0 1 0 0 0 0**
e(1,4)	**1 0 0 1 0 0 0**
e(2,3)	**0 1 1 0 0 0 0**
e(1,5)	**1 0 0 0 1 0 0**

IV. CURE AND CONTROL FLOW

CURE algorithm, which plays a major role in an extraction of individual behavior and in aspect of its collective behavior with scalability. It includes the representation of points that have been selected by using an analysis factor and its major description view are to be identified based on a CURE clustering algorithm. With the CURE clustering algorithm, the partitioned view of analysis are to be classified based on the factor of various view of aspect that we have included for the target consideration factor. The CURE algorithm continuously runs through its selected points in the network for finding out similarities. The advantage of considering CURE clustering is to be better scalability can be achieved compared to other clustering algorithm even when we compare it with ant based clustering.

Fig. 4 shows the control flow of whole system by how which the extraction of collective behavior of an individuals and unobserved individuals are to be done on a social media network.

At first, the extractor has been given with the input of target information with relational learning details, i.e to which social media network the target belongs to. Then with the given input, identified social media network view has been converted into an edge centric view. With the edge centric view, the relational edges are to be identified with the correspondence to the target. Then with this edge centric view, edge partition has been calculated based on the target information. Edge centric schematic representation, which deals with the whole system to be surrounded on towards it including the important parameters, techniques and algorithm to be build on through it for the purpose of extraction basis in the social media network to corner the target.

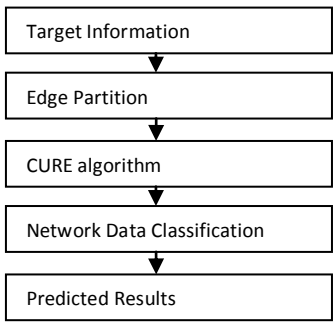

Figure 4. Control flow diagram

By representing the status of an edge partition, the various aspect of forming clusters are to be done based on an clustering algorithm called CURE. CURE analyses the similarities between communities, clusters or network and group them for better aspect of targeting an actor. Then the network data classification has to be done to the edge partitioned data with the selected classifier corresponding to the considered network, such as SVM, SCM etc. and finally, the results to the prediction of given target has been achieved with scalability.

Performance Analysis

The performance metric for the proposed CURE algorithm with edge centric clustering to achieve scalability has been done and compared with the existing clustering algorithms with the various techniques that they have already implemented in different applications for better efficiency and scalability achievement. Fig. 5 shows the scalability performance analysis with CURE clustering algorithm comparison to existing clustering algorithms such as k-means, modularity maximization, fuzzy C-means and K-modes. Whereas, the CURE has achieved the better scalability performance compared to other existing algorithms in the case of a clustering techniques to different types of applicable cases not limited to the application of an social media network connectivity alone.

Table 5 shows the performance of a facebook social media network with respect to the proportion of nodes and detection in micro and macro aspect. The four types of common existing techniques have been tested on through it for an aspect of comparison and to find the better clustering scheme applicable to the social media network to extract the target collective behavior. Edge cluster, which proves its efficiency and effectiveness over the network with high percentage consideration values for the target behavior to trace it over the considered network in social media. The proportion of nodes varies from 1% to 10%. With these proportions, the detection in micro and detection in macro has to be verified corresponding to edge cluster which includes the two sets to notify, the blog catalog and photo site to be viewed simultaneously. Modularity maximization follows the edge cluster actions with the accurate value parameters to be noted. Micro detections are to be compared with the detection in the case of macro. Detection of micro is considered to be better with the better propagation values.

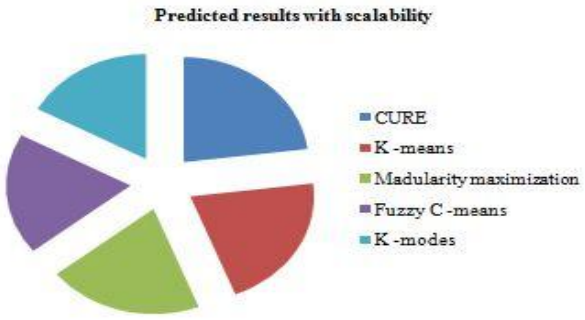

Figure 5. Scalability performance metric

Table 5. Performance on facebook network

Proportion of nodes		1%	2%	3%	. . .	10%
Detection in micro	Edge clusters	30.3	31.23	32.45		36.5
	Bicomponents	18.4	18.41	18.49		18.55
	Modularity maximization	20.7	23.45	25.21		28.36
	Node cluster	20.76	24.36	26.43		27.14
Detection in macro	Edge clusters	10.2	13.10	14.45		21.90
	Bicomponents	0.36	0.38	0.40		0.45
	Modularity maximization	10.20	12.09	14.24		16.12
	Node cluster	6.89	8.99	10.56		12.45

Table 6. Performance on orkut network

Proportion of nodes		1%	2%	3%	. . .	10%
Detection in micro	Edge clusters	22.3	31.63	35.45		40.5
	Bicomponents	23.9	24.41	25.49		25.55
	Modularity maximization	-	-	-		-
	Node cluster	20.6	24.56	28.43		32.14
Detection in macro	Edge clusters	19.2	24.10	26.45		31.90
	Bicomponents	6.36	7.38	7.40		7.95
	Modularity maximization	-	-	-		-
	Node cluster	17.8	18.9	23.56		26.45

Table 6 shows the clear overview of the performance of social media network orkut. Here as similar to the facebook the metrics are to be calculated with the comparison of existing clustering algorithms such as modmax etc. Here the modmax values are null and its fails to achieve the level to be considered for the formation of partitioning the data for the target behavior in a collective behavior along with the unobserved individuals also to be traced for the extraction.

V. CONCLUSION

This paper has introduced a new way to clustering with the classification that involved in an social media network for the aspect of achieving greater scalability in extraction of behavior of an individuals and also an collection of behavior of an individuals and also the behavioral relation with unobserved individuals with the edge centric clustering schema using CURE clustering algorithm to be applied to the input network. Then, with the edge partitions are to be formed with the affiliations of a target actor are to be identified with the social dimension representation in the concerned network that we are extracting the behavior of an actor. CURE algorithm deals with clustering for the target behavior and gives the result in a group by which the actor relation belongs to the same network or with some other network. Possible extensions and improvements of our model include meta features and different types of clustering algorithms on applications to improve better scalability for collective behavior.

VI. ACKNOWLEDGMENT

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REFERENCES

[1] J. Hopcroft and R. Tarjan, "Algorithm 447: efficient algorithms for graph manipulation," Commun. ACM, vol. 16, no. 6, pp. 372–378, 1973.

[2] Lei Tang, Xuei Wang and Huan Liu, "Scalable Learning of Collective Behavior".

[3] M. McPherson, L. Smith-Lovin, and J. M. Cook, "Birds of a feather: Homophily in social networks," Annual Review of Sociology, vol. 27, pp. 415–444, 2001.

[4] M. Newman, "Power laws, Pareto distributions and Zipf's law," Contemporary physics, vol. 46, no. 5, pp. 323–352, 2005.

[5] M. Newman, "Finding community structure in networks using the eigenvectors of matrices," Physical Review E (Statistical, Nonlinear, and Soft Matter Physics), vol. 74, no. 3, 2006.[Online]. Available: http://dx.doi.org/10.1103/PhysRevE.74.036104

[6] K. Yu, S. Yu, and V. Tresp, "Soft clustering on graphs," in NIPS, 2005.

[7] T. Evans and R. Lambiotte, "Line graphs, link partitions, and communities," Physical Review E, vol. 80, no. 1, p.16105, 2009.

[8] S. White and P. Smyth, "A spectral clustering approach to finding communities in graphs," in SDM, 2005.

[9] R.-E. Fan and C.-J.Lin, "A study on threshold selection for-label classication," 2007.

[10] S. Gregory, "An algorithm to find overlapping community structure in networks," in PKDD, 2007, pp. 91–102. [Online]. Available: http://www.cs.bris.ac.uk/Publications/ pub master.jsp?id=2000712

[11] X. Zhu, "Semi-supervised learning literature survey," 2006. [Online]. Available: http://pages.cs.wisc.edu/_jerryzhu/ pub/ssl survey 12 9 2006.pdf

[12] X. Zhu, Z. Ghahramani, and J. Lafferty, "Semi-supervised learning usinggaussian fields and harmonic functions," in ICML, 2003.

[13] F. Harary and R. Norman, "Some properties of line digraphs," RendicontidelCircoloMatematico di Palermo, vol. 9, no. 2, pp. 161–168, 1960.

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Design of Uniform Fiber Bragg grating using Transfer matrix method

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ABSTRACT:
The performance of a uniform fiber Bragg grating is depends on it reflectivity. The reflectivity is again depends on change of effective refractive index and length of the grating. This paper presents the design aspect of an optical fiber Bragg grating for maximum reflectivity. As fiber grating allows considerable amount of energy exchange between different modes of the fiber, couple mode theory which is solved by transfer matrix method is considered as good approximation to calculate the spectral response of fiber Bragg grating.

Key words: *Fiber Bragg grating, couple mode theory, transfer matrix method, reflectivity.*

I. INTRODUCTION:

Fiber Bragg grating is attracting considerable interest for application as sensing element, because of their intrinsic nature and inherent wavelength encoded operation. Fiber optic photosensitivity has indeed opened a new era in the field of fiber optic based devices [1]. The photosensitivity of optical fiber was discovered at the Canadian Communications Research Center in 1978 by Ken Hill et al. [2] during experiments using germanium-doped silica fiber and visible argon ion laser radiation. It was noted that as a function of time, light launched into the fiber was being increasingly reflected. This was recognized to be due to a refractive index grating written into the core of the optical fiber. It has the ability to alter the core index of refraction in a single-mode optical fiber by optical absorption of UV light. The photosensitivity of optical fibers allows the fabrication of phase structures directly into the fiber core, called *fiber Bragg gratings*. Photosensitivity refers to a permanent change in the index of refraction of the fiber core when exposed to light with characteristic wavelength and intensity that depend on the core material.

Fiber Bragg gratings, which operate at wavelengths other than near the writing wavelength , are fabricated by techniques that broadly fall into two categories: those that are holographic [3] and those that are noninterferometric, based on simple exposure to UV radiation periodically along a piece of fiber [4]. The former techniques use a beam splitter to divide a single input UV beam into two, interfering them at the fiber; the latter depend on periodic exposure of a fiber to pulsed sources or through a spatially periodic amplitude mask. There are several laser sources that can be used, depending on the type of fiber used for the grating, the type of grating, or the intended application.

The holographic technique for grating fabrication has two principal advantages. Bragg gratings could be photoimprinted in the fiber core without removing the glass cladding. Furthermore, the period of the photoinduced grating depends on the angle between the two interfering coherent ultraviolet light beams. Thus even though ultraviolet light is used to fabricate the grating, Bragg gratings could be made to function at much longer wavelengths in a spectral region of interest for devices which have applications in fiber optic communications and optical sensors.

The design of fiber Bragg grating depends on various parameters e.g length of the grating, period of gratings, refractive index of core and cladding, mode of excitation conditions and temperature. In this paper, the effect on the reflection spectra of fiber Bragg grating is analyzed at the varied grating length along with the variation of spectral shape with changing refractive index.

II. THEORY:

A fiber Bragg grating consists of a periodic modulation of the refractive index in the core of a single-mode optical fiber. In case of uniform fiber gratings shown in figure1, the phase fronts are perpendicular to the fiber's longitudinal axis with grating planes having constant period.

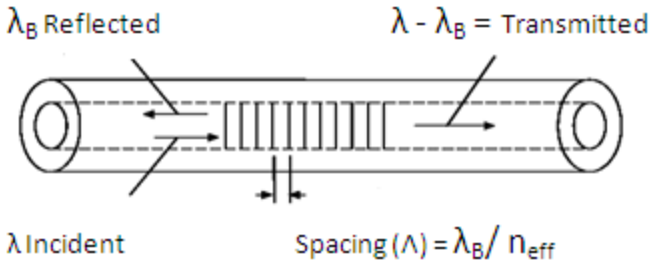

Figure1. Uniform fiber Bragg grating

The periodic perturbation of the refractive index causes the coupling between the different modes of light in the fiber grating. The wavelength for which the coupling between two modes is maximized is given by the following resonance condition:

$$\beta_1 - \beta_2 = m\frac{2\pi}{\Lambda}$$

where β1 and β_2 are the propagation constants of two modes, m is the order of diffraction and Λ is the period of the index modulation. Considering the two modes are identical ($\beta_1 = -\beta_2 = m\frac{2\pi}{\Lambda}$) and $\beta_2 < 0$ (mode propagates in the – z direction), we get the resonant wavelength for Bragg reflection:

$$\lambda = 2n_{eff}\Lambda$$

Couple mode theory:

Light guided along the core of an optical fiber will be scattered by each grating plane. If the Bragg condition is not satisfied, the reflected light from each of the subsequent planes becomes progressively out of phase and will eventually cancel out. Additionally, light that is not coincident with the Bragg wavelength resonance will experience very weak reflection at each of the grating planes because of the index mismatch; this reflection accumulates over the length of the grating.

This theory assumes that the mode fields of the unperturbed waveguide remain unchanged in the presence of weak perturbation. This approach provides a set of first-order differential equations for the change in the amplitude of the fields along the fiber, which have analytical solutions for uniform sinusoidal periodic perturbations. A fiber Bragg grating of a constant refractive index modulation and period therefore has an analytical solution. A complex grating may be considered to be a concatenation of several small sections, each of constant period and unique refractive index modulation. Thus, the modeling of the transfer characteristics of fiber Bragg gratings becomes a relatively simple matter, and the application of the transfer matrix method [5] provides a clear and fast technique for analyzing more complex structures.

Suppose two identical modes $Ae^{+i\beta z}$ and $Be^{-i\beta z}$ propagating in opposite directions through a Bragg grating. Due to periodic refractive index perturbation, the coupling coefficient will have a 'dc' and 'ac' component:

$$c(z) = \sigma(z) + 2k(z)\cos\left(\frac{2\pi}{\Lambda}z\right)$$

$$\sigma(z) = \frac{\omega}{c}\frac{\int_0^a\int_0^a \overline{\delta nco}(z)\ \Psi 2\ dx\ dy}{\int_0^\infty\int_0^\infty \Psi 2\ dx\ dy}$$

$$k(z) = \frac{v}{2}\sigma(z)$$

Where Ψ is the transverse profile of the identical modes, and a is the core radius of the fiber. The presence of the periodic index perturbation causes the two modes to be coupled such that their amplitudes A and B will vary along the propagation axis (z-axis) as follows:

$$\frac{dA}{dz} = i\sigma A + ikBe^{-}(2\beta - \frac{2\pi}{\Lambda})z$$

$$\frac{dB}{dz} = -i\sigma B - ikAe^{+}(2\beta - \frac{2\pi}{\Lambda})z$$

We can define the detuning δ to be:

$$\delta = \beta - \frac{\pi}{\Lambda} = \beta\left(\frac{1}{\lambda} - \frac{1}{\lambda_D}\right)$$

where $\lambda_D = 2n_{eff}\Lambda$ is the design wavelength of the grating. Now introducing another 'dc' self-coupling coefficient:

$$\hat{\sigma} = \delta + \sigma = \beta\,(1 + \frac{\overline{\delta neff}}{neff}) - \pi/\Lambda$$

It is also useful to introduce this substitution:

$$A(z) = R(z)\, e^{-i\delta z}$$

$$B(z) = S(z)\, e^{+i\delta z}$$

By introducing this equations we get

$$\frac{dR}{dz} = i\hat{\sigma}R(z) + ikS(z)$$

$$\frac{dS}{dz} = -i\hat{\sigma}S(z) - ikR(z)$$

To solve this system, a new substitution is required:

$$R(z) = r(z)e^{+i\delta z}$$

$$S(z) = s(z)e^{-i\delta z}$$

This gives us the following system:

$$\frac{dr}{dz} = iks(z)e^{-i2\delta z}$$

$$\frac{ds}{dz} = -iks(z)e^{+i2\delta z}$$

Transfer Matrix Method:

In the T-matrix method, the coupled mode equations are used to calculate the output fields of a short section dl_1 of grating for which the three parameters are assumed to be constant. Each may possess a unique and independent functional dependence on the spatial parameter z. For such a grating with an integral number of periods, the analytical solution results in the amplitude reflectivity, transmission, and phase. These quantities are then used as the input parameters for the adjacent section of grating of length δl_2. The different transfer matrix elements are shown as below:

$$F = \begin{bmatrix} \cosh\left(\frac{\Omega L}{N}\right) + i\sinh\left(\frac{\Omega L}{N}\right) & -\frac{k}{\Omega}\sinh\left(\frac{\Omega L}{N}\right) \\ -\frac{k}{\Omega}\sinh\left(\frac{\Omega L}{N}\right) & \cosh\left(\frac{\Omega L}{N}\right) - i\sinh\left(\frac{\Omega L}{N}\right) \end{bmatrix}$$

We can connect the fields at the two ends of the grating through

$$\begin{bmatrix} u(L) \\ v(L) \end{bmatrix} = T \begin{bmatrix} u(0) \\ v(0) \end{bmatrix}$$

Where $T = T_N * T_{N-1} * T_{N-2} * \ldots\ldots T_i \ldots\ldots T_1$

For entire grating $T=\begin{bmatrix} T11 & T12 \\ T21 & T22 \end{bmatrix}$

The reflection coefficient is calculated by the relation

$$R = \frac{T21}{T11}$$

Solution of the Couple Mode Equations:

If the grating is uniform along *z*, then the coupled mode equations are coupled first-order ordinary differential equations with constant coefficients, for which closed-form solutions can be found when appropriate boundary conditions are specified. The reflectivity of a uniform fiber grating of length L can be found by assuming a forward-going wave incident from $z = -\infty$, passing through the grating and requiring that no backward-going wave exists for $z \geq L$, i.e., $u(L) = 1$, and $v(L) = 0$. The amplitude and power reflection coefficients $\rho = v(0)/u(0)$ and $r = |\rho|^2$, respectively, can then be shown to be

$$\rho = \frac{v(0)}{u(0)} = -\frac{ksinh(\Omega L)}{\hat{\sigma}sinh(\Omega L)+i\Omega cosh(\Omega L)}$$

$$R = |\rho|^2 = sinh^2(\Omega L)/ (cosh^2(\Omega L) - \hat{\sigma}^2/k^2)$$

Where $\Omega = \sqrt{k^2 - \hat{\sigma}^2}$

III. RESULTS AND DISCUSSION:

The parameters used for the simulation of the fiber Bragg grating are as given in the table.1

Table1: simulation parameters

core refractive index	1.64
λ_B (center wavelength)	1550 nm
λ_1 (lower limit of wavelength)	1546.9 nm
λ_2 (upper limit of wavelength)	1553.1 nm
Δ_{neff}	0.5e-4 to 3.5e-4
v (fringe visibility)	1
Length (L)	2 mm to 35 mm
N (number of grating)	100
Λ (grating period)	L/N

For different values of grating length (table2), Reflected spectra was obtained and analyzed. From the spectra, it was confirmed that the spectral properties of uniform gratings comes out to be similar to sinc function. The reflection spectra for different grating lengths are shown in the figure 2,3,4.

Table2: Reflectivity for different grating length and for different deln

Grating Length in mm	Reflectivity (%) For deln(δ_n)=1e-4	Reflectivity (%) For deln(δ_n)=2e-4	Reflectivity (%) For deln(δ_n)=2.5e-4
2	14.77	44.83	58.85
3	29.43	70.21	82.57
4	44.83	85.52	93.22
5	58.77	93.2	97.51
8	85.44	99.39	**99.99**
10	93.22	**99.99**	99.99
12	96.92	99.99	99.99
14	98.61	99.99	99.99
15	99.09	99.99	99.99
17	**99.99**	99.99	99.99
20	99.99	99.99	99.99
22	99.99	99.99	99.99
25	99.99	99.99	99.99
27	99.99	99.99	99.99
30	99.99	99.99	99.99
32	99.99	99.99	99.99
35	99.99	99.99	99.99

It is observed that the reflectivity increases with the increase in length of the grating up to a particular length and beyond that it becomes saturated. After that, if the length is incremented further, reflectivity maintains the same value of 99.99%. The reflectivity reaches the maximum

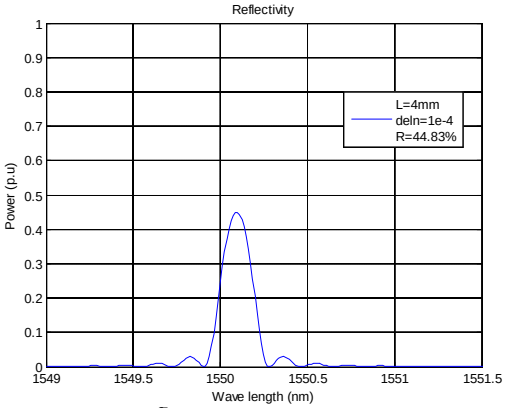

Fig.2 Reflective spectrum at L= 4mm

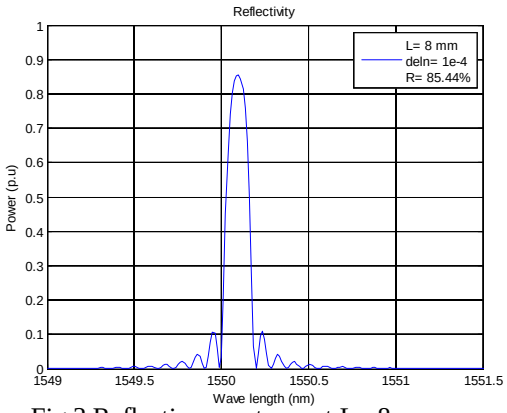

Fig.3 Reflective spectrum at L= 8mm

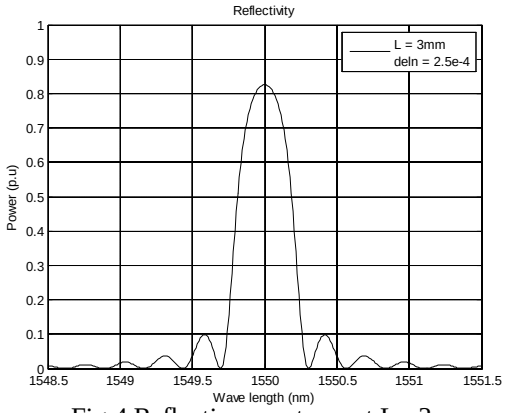

Fig.4 Reflective spectrum at L= 3mm

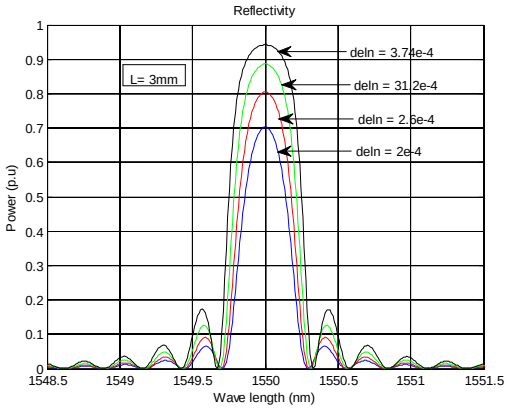

Fig.5 Reflectivity for different dlen

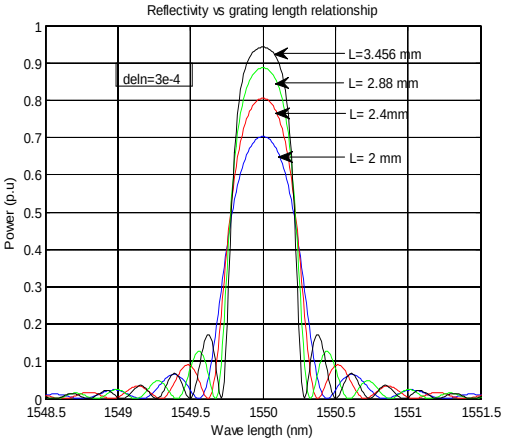

Fig.6 Reflectivity for different L

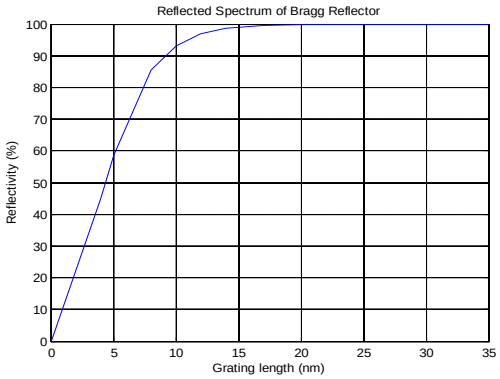

Fig.7 Reflectivity vs grating length

value but it is accompanied with a significant increase in the reflectivity of side lobes. It is observed from the fig.6 that the simulated fiber Bragg grating showed better performance as the grating length increased and achieved 99.99% at the grating length 17mm with effective refractive index of 1e-4.

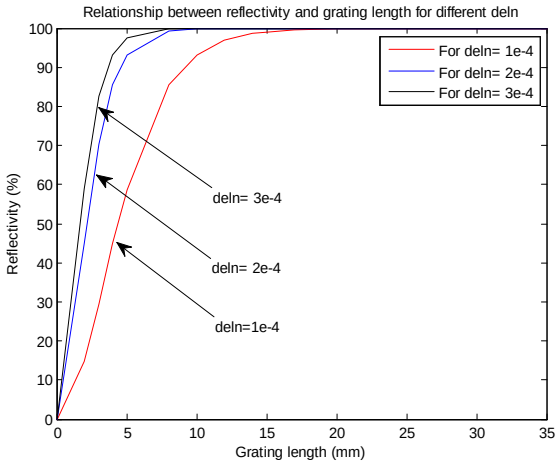

Figure.8Reflectivity vs grating length for different deln values

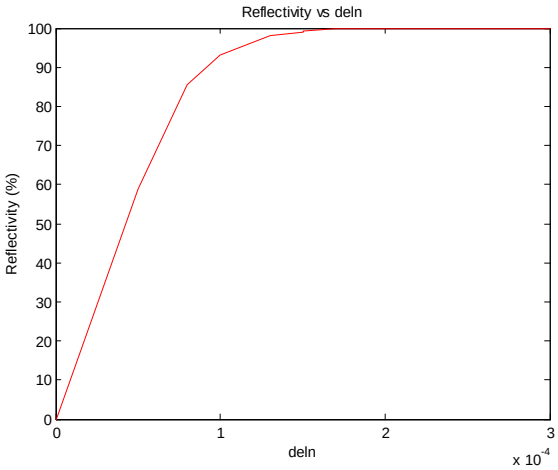

Figure.9 Relationship between reflectivity vs refractivity

From the figure.8 and figure.9 it is observed that the reflectivity changes due to the change of length of the grating as well as the change of the refractive index of the grating. Figure.8 shows that the length required to achieved 99.99% reflectivity for the grating having δ_n = 3e-4 is more than the other grating having different δ_n values.

IV. CONCLUSION:

This work draws the following conclusions:

1. The reflectivity of fiber grating increases with the increase in grating length. For strong grating, it has to be long and in the same time it has to have a large index change.
2. The grating with longer length with small index change has the narrow band width.
3. Grating may become saturated if it already met 99.99% reflectivity, beyond which increasing the length will only affect the bandwidth of the grating.
4. Bandwidth will increase as coupling coefficient (k) increases and will get smaller as L increases.

REFERENCES:

[1] A. Othonos and K.Kalli: Fiber Bragg Gratings: Fundamentals and Applications in Telecommunications and Sensing (Artech House, Boston, London, 1999).
[2] K.O. Hill, Y. Fujii, D.C. Johnson, B.S. Kawasaki, Photosensitivity in optical waveguides: Application to reflection filter fabrication, Appl. Phys. Lett. 32 (10) (1978) 647.
[3] W.W. Morey, G. Meltz, W.H. Glenn, Holographically generated gratings in optical fibers, Opt. Photon. News 1 (7) (1994) 8.
[4] K.O. Hill, B. Malo, K.A. Vineberg, F. Bilodeau, D.C. Johnson, I. Skinner, Efficient mode conversion in telecommunication fiber using externally written gratings, Electron. Lett. 26 (16) (1990) 1270.
[5] M. Yamada, K. Sakuda, Analysis of almost periodic distributed feedback slab waveguides via a fundamental matrix approach, Appl. Opts. 26 (16) (1987) 3474–3478.

Effect of Alkaline Activator on Workability and Compressive Strength of Cement Concrete with RHA

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ABSTRACT:

Objectives of the investigations- To *study the suitability of the RHA as a pozzolanic material for replacement of cement in concrete. To improve the early strength (at ages 3,7, 14 days) of concrete with RHA by using alkaline activator.*
To make the concrete economical. To develop and satisfy various structural properties like compressive strength, Workability and Alkalinity To see the effect of alkaline activator on cement concrete with RHA. To obtain specific strength within specific time of cement concrete with RHA for particular situation (i.e. high performance strength concrete for sea shore structure, prestressing, blasting, nuclear power plant, bridge structures etc.). To find alternative binders to manufacture the concrete. To use low cost agricultural bi-product. To reduce environmental pollution.

Scope of the investigation- *To study the effect of alkaline activator NaOH and RHA on compressive strength, workability and alkalinity of cement concrete for :-Concrete grade – M30, Water to cementitious material ratio 0.5,Alkaline solution to cementitious material ratio – 0.35, Concrete mixes with RHA – 0%,10%,20% and 30%, NaOH concentration in morality M - 1,2,3 and 4, Mix design by – DOE method, Superplasticizer – Hydraproof - 1.5% of cementitious material , Workbility- By slump and compaction factor test, Compression test specimen – cube size 150*150* 15 mm, Curing method and age – 1) water curing – 3,7 and 14 days*

Keywords: *Rice husk ash(RHA),Molarity(M),Alkaline activator,sodium hydroxide(NaOH), compressive strength, Concrete grade 30,hydration,pazolanic reaction, pH value,slump,workability, calcium silicate hydrate (C-S-H gel),silica,plasticizer,*

I. INTRODUCTION:

Pozzolanic activity of RHA :-In hydration of cement major cement compounds like dicalcium silicates (C_2S), tricalcium silicates (C_3S), tricalcium aluminate (C_3A) and tetracalcium alumino ferrite (C_4AF) reacts with water, produces stable compound calcium silicate hydrate (C-S-H gel), calcium aluminates hydrate (C_3AH_6),calcium ferrite hydrate (C_3FH_6) and calcium hydroxide $Ca(OH)_2$ respectively. Hydration compounds consists of calcium hydroxide, which is not desirable product in the concrete mass. Calcium hydroxide is soluble in water and gets leached out making the concrete porous.

$2(3CaO\ SiO_3) + 6H_2O \rightarrow 3CaO.2SiO_2.3H_2O + 3Ca(OH)_2$
$2C_3S + 6H \rightarrow {}_3S_2H_3$ (C-S-H) gel $+ 3Ca(OH)_2$
wt. 100 24 5 49
OR
$2(2CaO.SiO_2) + 4H_2O \rightarrow 3CaO.2SiO_2.3H_2O + Ca(OH)_2$
$2C_2S + 4H \rightarrow C_3S_2H_3$ (C-S-H) gel $+ Ca(OH)_2$
100 21 99 22

RHA which is rich in silica exhibit pozzolanic activity. Reaction take place between the reactive silica present in RHA and calcium hydroxide formed during hydration of cement, produces stable compound calcium silicate hydrate (C-S-H gel.)

$SiO_2 + Ca(OH)_2 \rightarrow CaO.SiO_2.H_2O$ (C-S-H gel)

Alkaline activator and hydration processes:-

The laboratory grade sodium hydroxide in flake form with 97.8% purity was used as alkaline activator for the activation of RHA. It observed that the pozzolanic action of RHA with calcium hydroxide formed during the hydration of cement is very slow. Therefore compressive strength for larger replacement of cement (i.e. more than 20%) by RHA at shorter duration (upto 28 days) is less than that of conventional concrete. For large replacement more than 40% of cement by RHA the demand of water increases and reduces the rate of setting of concrete. Less quantity of cement in concrete with RHA, produces small amount of calcium hydroxide $Ca(OH)_2$ during the hydration process, which is insufficient for hydration with large amount of reactive silica presenting concrete due to large percentage of RHA to complete the reaction.

$SiO_2 + Ca(OH)_2 \rightarrow CaO.\ SiO_2\ .H_2O$ (C-S-H)

Therefore to activate the reaction of this excess reactive silica, activator in the form of Sodium Hydroxide (NaOH) is added in the concrete mix. The hydration process between the reactive silica (SiO_2) & Sodium Hydroxide (NaOH) produces stable compound sodium metasilicate and water

$SiO_2 + NaOH \rightarrow Na_2SiO_3 + H_2O$

Literature review : Literature is reviewed to learn about the results of previous studies that were related to this study.Need to find alternative binders to manufacture the concrete. RHA is a good super-pozzolanas , RHA much finer than cement particle size less than 45 micron, it fills the voids between cement and aggregate , Potential use of low cost rice husk ash. and gives the strength and density to the concrete. It can be reduce the amount of cement in the concrete mix. RHA reduces the thermal cracking High performance concrete with RHA It is an attempt made to replace the cement by part with RHA ,the agro waste product which is available in various parts of India in large amount. The rice husk ash used by various researchers was open burnt so the pozzolanic properties are not reserved.Here the used RHA is obtained From factory single source satisfied all the requirements of pozzolonic material as per I.S. The effect of higher percentage replacement, concentration of sodium hydroxide, fineness of source materials, type of activators, curing duration were not well investigated. These are the weak areas in which research work should be carried out. Therefore experimental work carried out in the project has been highlighted. From literature survey it is observed that the parameter suggested by different researchers and their results are not matching with each other ,may be due variation in properties of materials considered in the work.

System development:-Selection of various Parameters :-

Material properties:- RHA, F.A. ,C.A., Water, Cement & Super plasticizer ,RHA %, w/ b ratio, Curing method, temperature & age, Alkaline solution –to – cementitious material ratio by mass Alkaline activators Concentration of sodium hydroxide , Preparation of Sodium hydroxide solutuon:-

Molecular wt. of 40. 40gm NaOH / lit. =1M, Temp. rise 70^0c to 80^0c.

Fine Aggregate :- Locally available river sand is used .The sand is sieved by I.S. sieve of size 4.75 mm. Grading Zone 1 (IS 386-1970). properties of fine aggregates are tested as per IS 2386 (part 1,2 and 3) 1963 Method of tests for aggregate for concrete and confirming to IS 386-1970.

Coarse Aggregate :- Crushed angular basalt stone aggregate from a local source are used. 20mm and 10mm aggregates are used in 60:40 proportions Properties of coarse aggregates are tested as per IS 2386 (part 1,2 and 3) 1963 Method of tests for aggregate for concrete and confirming to IS 386-1970

Water :- Mixing water Potable tap water and distilled water

Cement :- Ultra-tech cement 53 grade OPC.Obtained from single source used.

Concrete mix design - Considerations : Design method used – D.O.E method.1988 British method. Concrete mix Design- for Characteristic strength 30 MPa . Crushed aggregates ,grading of fine aggregates 27% passes through 600 micron sieve , placing conditions requires a slump range 30-60 mm. concrete is to be used in mild exposure condition. Cover of reinforcement adopted 25 mm, specific gravity of fine aggregate 2.6 and coarse aggregate 2.66, proposed cement replacement by RHA 10%,20% and 30% by weight,

Batching, Mixing, Casting, curing and testing the specimens-

Concrete Batching method-Weight batching, Mixing procedure – IS:526-1959. Each batch of concrete immediately tested for workability by slumps as per IS:1199-1959, compaction factor . Mould used-150*150*150 mm size, oiling inner faces Compaction- by table vibrator and tamping rod, De-moulding period-24 Hrs. Curing method - Water curing - 3 days, 7days and 14 days,

Materials required for different mixes in kg /m^3

(RHA replacement 0%, 10%, 20% 30% for w/c ratio 0.63,0.58,0.54,and 0.50 respectively. (As per mix designs)

Sr. No.	Ingredients	Mix designations			
	Rice husk ash replacement	0%	10 %	20%	30%
1	W/c ratio	0.63	0.58	0.54	0.50
2	Cement	333.33	314.90	295.31	267.23
3	Rice husk ash	000.00	34.98	73.83	114.53
4	Cementitious material	333.33	349.88	369.14	381.76
5	F.A.	886.83	851,71	832.21	819.64
6	C.A.(60%) 20mm	572.30	591.18	599.19	612.35
7	C.A(40%). 10mm	381.54	393.13	399.46	408.23
8	Total C.A.	953.84	985.31	998.65	1020.58
9	Water	210	205	200	190
10	Super plasticizer dosel.5% of cementitious material 1.5% of cementitious material	5.0	5.25	5.54	5.73
11	(C+RHA) : F.A. :C.A. Proportion	1:2.66:2.86	1:2.43:2.81	1:2.25:2.70	1:2.14:2.67

Performance Analysis.

Parameter tested:-

i) Workability of RHA cement concrete with and without activator, ii) Compressive strength of RHA cement concrete with and without activator, iii) Alkalinity of cement concrete with, without RHA & NaOH, Observations and comparison between normal cement concrete mix , cement concrete with RHA, with and without alkaline activator NaOH.

1. Normal cement concrete (Cement concrete without RHA ,alkaline activator): (IDMark : CA0MO) Materials requirement, observations, & test results: (Table 1,2,3.)

Materials requirement for 9 cubes:

Table 1. Material requirement

Material	Required wt (kg)		Material	Required wt (kg)
Cement+RHA	11.65		NaOH Solution.	Nil.
Cement	11.65		Water in NaOH Solution	Nil.
RHA	Nil		NaOH Solid	Nil.
F.A.	30.99		Total Water	7.33
C.A. (20mm)	19.20		Free water	Nil
C.A. (10mm)	14.12		Plasticizer	Nil.
Total C.A.	33.32			

Observations and test results:

Table 2. Slump, weight, compactibility,compaction factor,pH,bleeding,segregation.		
Wt. of uncompacted Concrete (kg) :22.980	**Wt. of compacted Concrete (kg) : 23.420**	**Compaction factor : 0.98**
Slump (mm) : 180	**Compactibility :** Good	**Bleeding :** Nil
Segregation : Nil	**Finish of cube** : Good	**pH**=11.55

Table 3. Compressive Strength0f normal cement concrete in Mpa

Sr. No.	Curing Period in days	Wt. in Kg	Density (Kg/m^3)	Load KN	Comp Strength N/mm2	Avg. Comp. Strength N/mm^2	pH
1	3	8.770	2598.5	490	21.77	21.47	11.15
2	3	8.700	2577.7	480	21.33		
3	3	8.720	2583.7	480	21.33		
4	7	8.500	2518.5	650	28.88	27.84	11.14
5	7	8.660	2565.9	610	27.11		
6	7	8.600	2548.1	620	27.55		
7	14	8.705	2579.9	750	33.33	33.03	11.09
8	14	8.585	2543.7	740	32.88		
9	14	8.630	2557.0	740	32.88		

2. Cement concrete with RHA and Alkaline activator (NaOH)

Observations and results:

a) Slump: Table 4

Table 4 :Slump			
Conc. Of NaOH	Slump in mm for percentage cement replacement by RHA %		
in (M)	10%	20%	30%
0M	8	4	0
1M	8	5	1
2M	9	5	1
3M	10	6	2
4M	11	7	3

Figure 1. (Ref.Table 4)

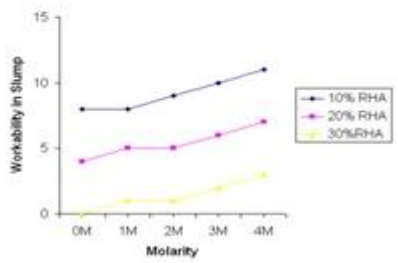


Table 5 :Compressive strength							
SR. NO.	RHA %	DAYS	Compressive Strength in MPa				
			Alkaline activator concentration in molarity (M)				
			0 M	1M	2M	3 M	4 M
1	0	3	24.33	-	-	-	-
	10		21.76	18.51	17.77	15.85	14.51
	20		18.66	23.18	12.29	11.55	11.99
	30		12.29	11.85	11.99	12.0	12.14
2	0	7	27.90	-	-	-	-
	10		27.84	23.66	22.81	19.10	16.29
	20		23.25	18.51	17.92	15.25	16.14
	30		13.62	14.66	15.10	15.20	15.40
3	0	14	33.00	-	-	-	-
	10		33.03	25.92	24.43	23.70	21.33
	20		33.92	25.18	24.14	17.03	19.40
	30		18.36	18.96	19.55	20.12	21.03

Figure 2 (Ref. Table 5) (RHA 10 %)

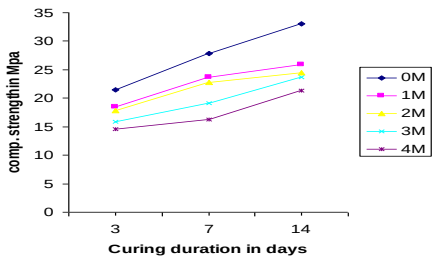


Figure 3 (Ref. Table 5) (RHA 20%)

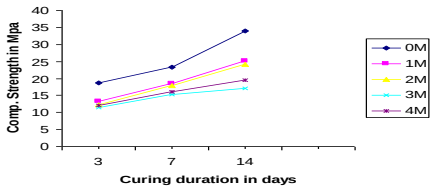


Figure 4 (Ref. Table 5) (30% RHA)

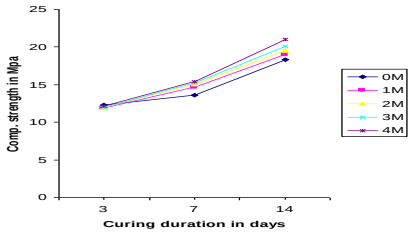
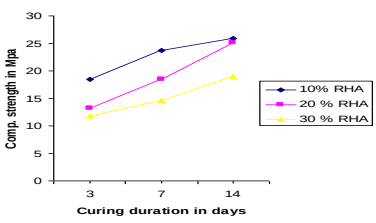
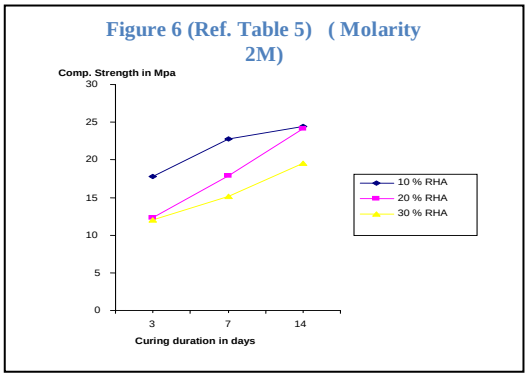
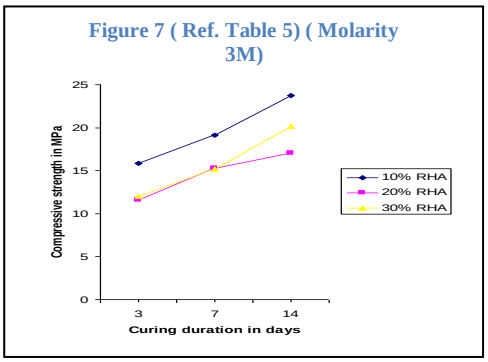
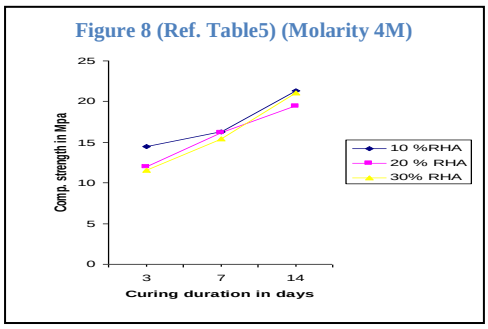


Figure 5 (Ref. table5) (Molarity 1M)









Discussion:

1) For 10 % RHA without NaOH comp. strength same as control mix with duration 7 &14 day. 2) At 14 days It is equal to reference concrete. reason may be due to RHA acts as a filler material or slow pozolanic reaction takes place with reactive silica.
3) For 10,20 % RHA,3,7,14 days comp. strength decreases with Increase in NaOH concentration, reason may be due to leaching or excess water.
4) But for 20 % RHA ,3 days comp. strength increases at 1M NaOH concentration, reason may be due to pozolanic reaction with reactive silica.
5) For 30 % RHA 3,7,14 days comp. Strength increases with increase in NaOH concentration and it is higher than reference concrete, reason may be due to pozolanic reaction takes place with reactive silica.

Conclusion: It shows even by replacing 30 % cement by Rice Husk Ash, required compressive strength can be achieved by using alkaline activator (NaoH). And thus Rice husk cement concrete of required grade for particular purpose may be prepared along with some performance test.

REFERENCES:

[1.] Dr.S.K.Sekar, V Ramasamy & S.Ganesh," Effect of Rice Husk Ash Mechanical properties of High Performance Concrete ". Proceedings of the National Conference on Concrete Technology for the Future, NCCTF-2006, Kongu Engg.Collage,Erode, Tamilnadu pp. 1 – 10

[2.] Dr.J.V.Ramasamy, K.R.Palasamy & P.R.Nagrajan "Rheological and Strength Characaristics of Concrete with Rice Husk Ash". Proceedings of the National Conference on Concrete Technology for the Future, NCCTF-2006, Kongu Engg.Collage,Erode, Tamilnadu pp. 91-97

[3.] Salim Ahmed Barbhuiya, Pichai Nimityongskul and Junlatep Chitasombuti "Use of Classified rice husk ash for high strength concrete". The Indian Concrete Journal, May 2006, pp. 11- 16

[4.] Mehata P.K. "Properties of Blended Cement made from Rice Husk ash" ACI Journal, Sept 1977, pp. 440-442

[5.] M. Temimi & R. Jauberthie "Rice Husk ash as filler in the concrete". Indian concrete Journal, May – 1998, Volume 72, pp. 241-244

[6.] Agus S. Muntohar & Basha Roslan Hashim "Effect of Rice Husk as on Plasticity and Compaction " Dept. of Civil Engineering, Muhammadiyah University, Indonesia & Malya university, Malaysia.

[7.] Ms. Nazia Pathan "Use of Rice Husk Ash in making High Performance concrete" National Seminar on concrete structure.7th & 8th Feb.2003. Dept. of Civil Engineering, KITS, Ramtek (MH)

[8.] Dr.M.V.S.Rao & Dr.K.M Rao"High Fly ash concrete with Rice husk ash as an Admixture". IE (I) Journal-CV, Vol.80, August 1999, pp. 57-63

[9.] Seshagiri Rao M.V. & Rama Rao G.V. "High Performance Rice Husk Fiber reinforced concrete with chicken mesh". Proceedings of the INCONTEST 2003 at Kumar guru College of Technology, Coimbatore, 10-12 September 2003, pp. 280-293

[10.] M.B.Dhockchaule, S.S.Choudhari & Ghumare S M "Behavior of Concrete with Rice Husk Ash". Proceedings of the National Conference on Concrete Technology for the Future, NCCTF-2006, Kongu Engg.Collage,Erode, Tamilnadu pp. 98 - 108

[11.] Astrom Mariya "Rice Husk ash as an additive in concrete reinforced with natural fibers " Civil engineering Dept. 23rd July 1999

[12.] Marceline A.D " Strength and durability of rice husk ash –modified concrete in the marine environment "Florida Atlantic University, Aug.2006..

[13.] Mauro M.T.,Carlos A. R. da Silva, Jorge L. Akasaki. "The Possibility of Adding Rice Husk Ash to the Concrete" Civil Enggineering Department, FIES, Brazil pp.1-9

[14.] Mehata P.K. "Rice Husk ash cement, High quality- Acid resisting" ACI Journal May 1975.

[15.] Bronzeoak.L.K. " Rice Husk Ash Market Study" UK Company, Expt. No-129, Published 2003

[16.] V.Pandey, C .R. Sharma, Krishna Murari and J.P. Singh, "Behaviour of Fly ash Mixed Concrete –A case Study". Proceedings of the NCAMMCS, 05 at I.I.T. Madras, 12-13 August 2005 ,pp 169-175.

[17.] N.P.Rajamene and D. Sabitha, " Effect of Fly ash and Silica fume on Alkalinity of Cement Mortars". The Indian Concrete Journal,March 2005,pp.43-48.

[18.] A.Palomo and A.Fernandez- Jiinenez, "Alkaline Activation of FLY Ashes.Manufacture of Concrete Not Containing Portland Cement"Conference in Institute Eduardo Torroja (CSIC),Madrid, Spain, 1999,pp.1-8.

[19.] V.F.Barbosa , K.J.Mackenzie, & C.Thaumaturgo, " Synthesis and Characterisation of Materials Based on Inorganic Polymers of Alumina and Silica: Sodium Polysialate Polymers", International Journal of Inorganic Materials, Vol.2 no.4,2000,pp.309-317.

[20.] Djwantoro Hardjito, Steenie E. Wallah, D.M.J. Sumjouw and B.VRangan, "Geopolymer Concrete: Turn Waste into Envirnmentally Friendly Concrete",in International Conference on Recent Trends in Concrete Technology and Structures (incontest), 2003, Coimbatore, 10-12 September 2003, India, pp. 129-140.

[21.] Djwantoro Hardjito, Steenie E. Wallah, D.M.J. Sumjouw and B.V.Rangan, " Properties of Geopolymer Concrete with Fly Ash as Source Material: Effect of Mixture Composition ," Seventh CANMET/ACI international Conference on Recent Advances in Concrete Technology, Las Vegas, USA 26-29 May ,2004 www.geopolymer.org/.

[22.] Djwantoro Hardjito, Steenie E. Wallah, D.M.J. Sumjouw and B.V Rangan, " Fly ash Based Geopolymer Concrete, Construction Material for Sustainable Development", Invited paper. Concrete World:Engineering and Materials . American Concrete Institute, Institute, India Chapter, Mumbai. India 9-12 December 2004, pp. 11-24.

[23.] Djwantoro Hardjito, Steenie E. Wallah, D.M.J. Sumjouw and B.V.Rrangan, "on the deveiopment of FLY Ash- Based Geopolymer Concrete".ACI Materials Journal, November- December 2004, pp. 462-472.

[24.] N.P.Rajamane, D.Sabitha, and P.K.Shijna, "Feasibility of Achiving 40 Mpa Strength in 4o Hours in Mortars(Without Portland Cement)", CE & CR Journal ,April 2005, pp.36-43

[25.] S .V.Patankar and S.S. Jamkar, "Fly ash Concrete Actvated by Alkaline Actvators",Proceedings of the NCAMMCS- 05 AT I.I.T. Madras, 12-13 August 2005, pp.64-70.

[26.] Zhang Yunsheng and Sun Wei "Fly ash Based Geopolymer Concrete ",The Indian Concrete Journal, January 2006, pp. 20-24.

[27.] IS: 1727, "Methods of test for pozzolanic materials", Bureau of Indian Standards, New Delhi, 1967.

[28.] A.M. Nevelle, "Properties of Concrete", Published by English Language Book Society, Longman.

[29.] M.S. Shetty, "Concrete Technology, Theory and practice", Published by S. Chand & Co., New Delhi.

[30.] IS: 516 "Methods of test for Strength of Concrete", Indian Standards Institution, Manak Bhavan, New Delhi, December 1959

[31.] IS: 2386(Part III) "Methods of test for Aggregates for Concrete", Indian Standards Institution, Manak Bhavan, New Delhi, October 1963

[32.] Kulkarni P.D and Mittal L.N "Laboratory Manual for Concrete Technology" Technical Teacher's Training Institute, Chandigarh, Second Edition 1985.

[33.] Information book, Ambuja Technical Literature Series -2, Portland Pozzolana Cement, Physical and Chemical Properties, Published- Gujarat Ambuja Cement Ltd.Technical Services Division, January 2004.

[34.] I.S. 383, "Specifications for Coarse and Fine Aggregates from Natural Sources for Concrete", Bureau of Indian Standards, New Delhi, 1970.

[35.] I.S. 456, Indian Standard "Code of Practice for Plain and Reinforced Concrete," Bureau of Indian Standards, New Delhi, 2000.

[36.] I.S. 10262, Indian Standard ″Recommended Guidelines for Concrete Mix Design" Bureau of Indian Standards, New Delhi, 1982

Priority Based Service Composition Using Multi Agent in Cloud Environment

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ABSTRACT:

Cloud computing is a highly research area in the technical I.T field and economic world, and many of the software industry have entered the development of cloud services. It is the Preeminnt on-demand service system along with a "Pay-as-you-go" Policy. Agent-based Cloud computing consist of the design and development of software agents Cloud service discovery, finding the appropriate service and service composition. Distributed and constantly changing Cloud computing environments pretense new challenges to automated service composition such as: (i) Dynamically contract service providers, which set service fees on a supply-and-demand basis, and (ii) Dealing with incomplete information regarding Cloud resources.Sometimes it allows resource agents to take advantage of the delegation of tasks, e.g., when a resource agent delegates a task to another resource agent given a failure.Proposed work contains designing a mechanism like adjusts existent service compositions to changes in consumer requirements, for example, a Cloud consumer demanding for more service to its currently contracted Broker Agents. Proposed system assume that smaller no. of length service has higher priority because less collboration among service agent and average time is also reduced so priority is also consider at the time of service composition.

KeyWords: *Agent, Broker, Composition , Consumer, Multi-Agent, Priority, Provider*

I. INTRODUCTION

Imagine yourself in the world where the users of the computer of today's internet world don't have to run, install or store their application or data on their own computers, imagine the world where every piece of your information or data would reside on the Cloud (Internet). Some analysts and vendors define cloud computing narrowly as an updated version of utility computing: basically virtual servers available over the Internet.

It is a manner of computing in which dynamically scalable and virtualized resources are provided as a service over the Internet for the users. Consumers need not have knowledge of, proficiency in, or control over the technology infrastructure "in the cloud" that supports them. The concept incorporates infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS) as well as Web 2.0 and other recent technology trends which have the common theme of confidence on the internet for satisfying the computing needs of the customers.

Cloud computing is an emerging paradigm in the computer industry where the computing is moved to a cloud of computers. It has become one of the buzz words of the industry. Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). Servers in the cloud can be physical machines or virtual machines. In the business model using software as a service, users are provided access to application software and databases. The cloud providers manage the infrastructure and platforms on which the applications run. End users access cloud-based applications through a web browser or a light-weight desktop or mobile app while the business software and user's data are stored on servers at a remote location.At a global level, Cloud architectures can benefit government to reduce duplicate efforts and increase effective utilization of resources.

The basis of cloud computing is to create a set of virtual servers on the available vast resource pool and give it to the clients. Any web enabled device can be used to access the resources through the virtual servers. The main criteria of research are related to following.

1. It gives flexible environment to the client.
2. Because of multi agent process will be easy.
3. Average time is also reduced at the time of service composition because of agent.

II. THEORETICAL BACKGROUND

Many people are confused as to exactly what cloud computing is, especially as the term can be used to mean almost anything. Roughly, it describes highly scalable computing resources provided as an external service via the internet on a pay-as-you-go basis. The cloud is simply a metaphor for the internet, based on the symbol used to represent the worldwide network in computer network diagrams.

Economically, the main appeal of cloud computing is that customers only use what they need, and only pay for what they actually use. Resources are available to be accessed from the cloud at any time, and from any location via the internet. There's no need to worry about how things are being maintained behind the scenes – you simply purchase the IT service you require as you would any other utility. Because of this, cloud computing has also been called utility computing, or 'IT on demand'.

2.1. Introduction to Service Composition

If an application or a client requires functionalities which can not be provided by a single service provider, one of the main functions of a service-oriented architecture (SOA) platform is to make it possible to composite several services in order to respond to the expressed needs. This function is referred to as service composition[14].

In Cloud service composition, collaboration between brokers and service providers is essential to promptly satisfy incoming Cloud consumer requirements. These requirements should be mapped to Cloud resources, which are accessed via web services, in an automated manner. However, distributed and constantly changing Cloud computing environments pose new challenges to automated service composition such as: (i) Dynamically contracting service providers, which set service fees on a supply-and-demand basis, and (ii) Dealing with incomplete information regarding Cloud resources (e.g., location and providers) [4].

Cloud computing provide elastic services, high performance and scalable data storage to a large and everyday increasing number of users. Here we are using agent based technique to provide effective service. An agent is a computational entity that acts on behalf of another entity (or entities) to perform a task or achieve a given goal [3]. Generally a cloud service lifecycle consists of service requirements, service discovery, service negotiation, service composition, and service consumption [1]. Generally no single web service can satisfy the functionally required by the user, so there is a need of combine existing service together in order to fulfil the requirement. So our main focus is on service composition [8].

Multi-Agent system represent computing paradigm based on multiple interacting agents that are capable to intelligent behaviour. Software agent used some AI approach based on some co-operation among several agents result in a solving large complex problem which keeps execution time low. Main focus is of cloud computing is efficient use of infrastructure in reduced cost. MAS can run on a cloud infrastructure or most compute-intensive part of it can be hosted in cloud whereas the light part can run on a local server or simply on client pc. So finally agent become more efficient and at the same time lighter & smarter [3].

On the other hand, in agent and multi-agent system (MAS) communities in order to model autonomous and interactive agents and models to enable their coordination. Indeed, analogously to service collaboration, coordination among autonomous agents is defined as the process of organizing and distributing actions of a (distributed) system in order to achieve a specific goal or to obtain better system flexibility[14].

2.2. Approach to Service Composition

First of all we have to define web service model. The web service model consists of three entities, the service provider, the service registry and the service consumer [13].

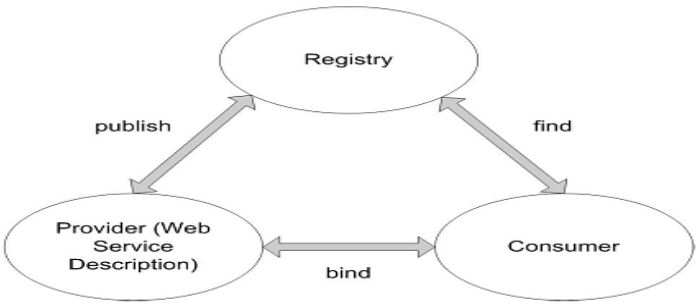

Figure 1.Web Service Model[13]

Basically, there is a 5 step model for service composition process. Each step requires different language as well as different platforms. Steps include service presentation, translation, process generation, evaluation & execution [5].

There are 4 different languages which are generally used for service composition. 1) UDDI (Universal Description Discovery Integration), 2) WSDL (Web Service Description Language), 3) SOAP (Simple Object Access Protocol) & 4) BPEL4WS (Business Process Execution Logic for Web Service) [8].

2.3. Framework for Service Composition

Figure 2 shows the framework for the service composition system. Service requestor will give requirement then translator will translate and convert this requirement in machine understandable form. Process generator will generate process according to service requestor. Evaluator will evaluate the best process among list of process. Finally execution engine will execute the result and delivered it to the service requestor.

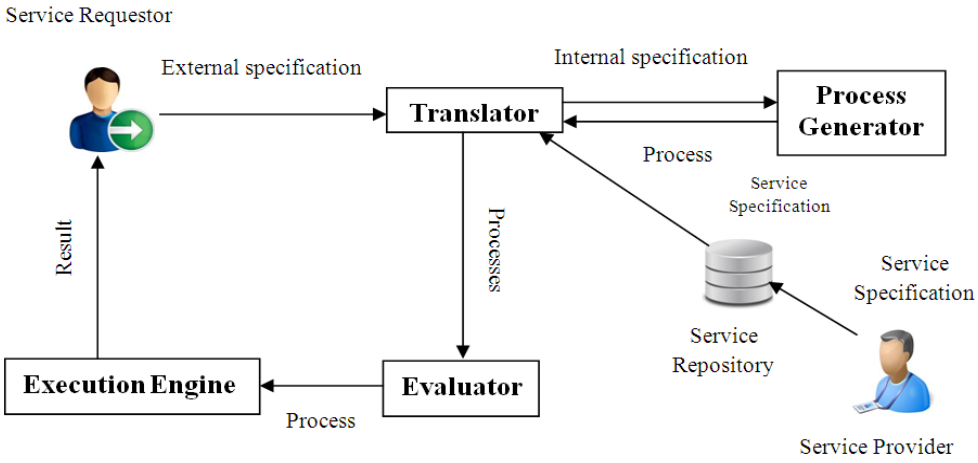

Figure 2. Framework of the Service Composition System [5][8]

III. PROPOSED ALGORITHM

3.1. Introduction to System

This system describes how service composition will execute at the time of dynamically changing the consumer requirement. First of all consumer will place their requirement. Then priority will be assigned to each service based on requirement. Smaller length service will execute first. Services are available with different provider and at the time of consumer requirement services are coming from different provider and at last all services are composite together and delivered to the consumer.

3.2. Proposed Algorithm

Priority Based Dynamic Service Composition(PBDSC)

The proposed algorithm is as follows.
Step 1: Read the consumer requirement and store all the values in list.
Step 2: For each request assign the priority of different parameter and store the priority value.
Step 3: For each parameter calculate the total of each priority .
Step 4: Sort the Sum of values.
Step 5: Send consumer request for execution & store consumer ID.
Step 6: For each Requirement do
Send CFP (Call For Proposal) message to broker agent.
check if broker agent has particular service then
send accept proposal message to consumer & store broker ID.
else
send reject proposal message.

Step 7: Ask to consumer for extra service.
Step 8: Check if any extra service requirement then go to step 6.
Step 9: If broker agent has no service available then broker agent will contact another broker agent for service and store broker ID and service will provided by another broker agent.
Step 10: Integrate all service together and delivered to consumer.

3.3. Description of Algorithm

Step 1-5 describes that collect consumer requirement and how to assign the priority to job. First of all read the consumer requirement store this requirement into list. Now for each request assign the priority of different parameter and store the priority value. Then for each parameter calculate the total of each priority. At last sort the sum of priority values. And smallest priority job will be execute first so send it for execution.

Step 6 describes for each proposal send call for proposal message to each broker agent and if broker agent has particular service then send accept proposal message else send reject proposal message.

Meanwhile if consumer wants to change their requirements then consumer has to put their requirement in service requirement table after step 6 broker will check SRT if any extra requirement. If SRT table has any requirement then again searching for service from previously allocated broker agent and if broker agent has no more service then broker agent will contact another broker agent and service will be provided by another broker agent.

At last service will be integrated together and composite service will be delivered to the consumer.

3.4. Experiments and Results

Table 1 shows the average executime in seconds(Sec) with increasing no. of cloudlets(jobs). Here Results are compared with existing techniques.

Table 1. Results of Proposed Algorithm

Existing Service Composition Technique		Proposed Service Composition Technique	
No. of Cloudlets(Jobs)	**Average Execution Time(Sec)**	**No. of Cloudlets(Jobs)**	**Average Execution Time(Sec)**
10	5	10	4.7
20	10	20	7.68
30	14.99	30	10.26
40	19.58	40	11.58
50	24.99	50	18.56
60	29.99	60	19.94
70	34.96	70	20.91
80	39.56	80	22.02
90	44.96	90	25.77
100	49.99	100	29.42

Figure 3 shows the average execution time is less then the existing service composition technique.

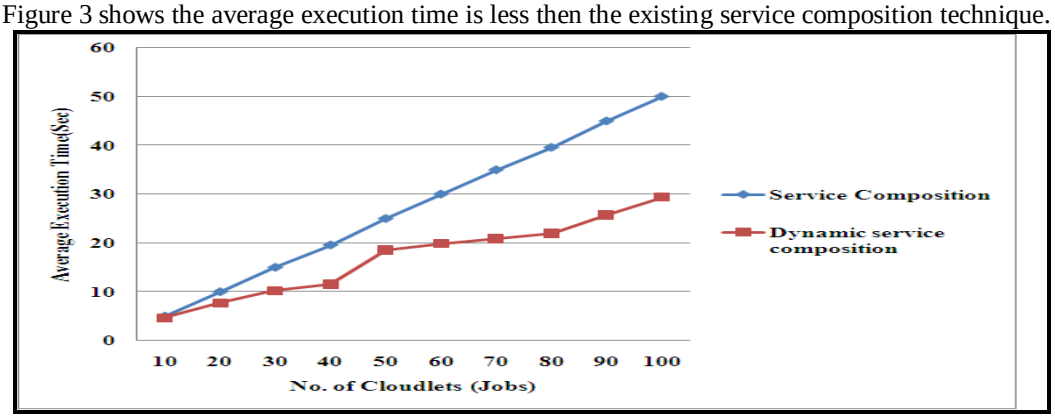

Figure 3. Result of Proposed Algorithm

CONCLUSION

In this wide and distributed environment we need service composition to answer different requests. It has aimed to give an overview of recent progress in automatic web services composition.At first, we propose a five-step model for web service composition process. The composition model consists of service presentation, translation, process generation, evaluation and execution. From the perspective of cloud computing, this work is related to the field of Cloud resource management by devising several approaches for facilitating Cloud service discovery, service negotiation, and service composition. When dynamic service composition is exploited for achieving better flexible result. Proposed algorithm is used for priority based web service composition as well as

it is also works with changing consumer requirements. So flexibility at user side will be improved. Again average time to compose service together is also less because there is a less colloboration among service agent.

REFERENCES

[1.] K. M. Sim "Agent-based Cloud Computing" IEEE Transactions on Services Computing, Issue 99, 2011.

[2.] H. Tong, J. Cao, S. Zhang, and M. Li "A Distributed Algorithm for Web Service Composition Based on Service Agent Model" IEEE Transactions On Parallel And Distributed Systems, Vol. 22, No. 12, pp-2008-2021, December 2011.

[3.] D. Talia "Cloud Computing and Software Agents: Towards Cloud Intelligent Services", in proc. Of CEUR-WS, Vol.741, 2011, pp-2-6.

[4.] J. Octavio, G. Garcia and K.M. Sim" Self-Organizing Agents for Service Composition in Cloud Computing" 2nd IEEE International Conference on Cloud Computing Technology and Science, pp-59-66, 2010.

[5.] A.VishnuVardhan, M.S.SaleemBasha, P.Dhavachelvan "An Overview of Web Services Composition Approaches" international Journal of Computer Applications (0975 – 8887) Volume 29– No.8, September 2011.

[6.] W.T. Tsai, P. Zhong, J. Balasooriya, Y. Chen, X. Bai, J. Elston"An Approach for Service Composition and Testing for Cloud Computing "2011 Tenth International Symposium on Autonomous Decentralized Systems.

[7.] C. Seh Wu and I. Khoury "Tree Based Search Algorithm for Web Service Composition in SAAS", 2012 Ninth International Conference on Information Technology- New Generations.

[8.] J. Rao and X. Su, "A Survey of Automated Web Service Composition Methods" Proc. First Int'l Workshop Semantic Web Services and Web Process Composition (SWSWPC), pp. 43-54, 2004.

[9.] G. B. Chafle, S. Chandra, V. Mann, and M. G. Nanda, "Decentralized orchestration of composite web services" in Proc. of the 13th international World Wide Web Conference on Alternate Track Papers & Posters, ACM, New York, NY, pp. 134-143,2004.

[10.] R. Aggarwal et al., "Constraint Driven Web Service Composition in METEOR-S" Proc. IEEE Int'l Conf. Services Computing (SCC), pp. 23-30, 2004.

[11.] Z. Maamar, S.K. Mostefaoui, and H. Yahyaoui, "Toward an Agent-Based and Context-Oriented Approach for Web Services Composition" IEEE Trans. Knowledge and Data Eng., vol. 17, no. 5, pp. 686-697, May 2005.

[12.] J. Yan, J. Zhang, J. Lin, M. B. Chhetri, S. K. Goh, and R. Kowalczyk "Towards Autonomous Service Level Agreement Negotiation for Adaptive Service Composition" 10th International Conference on Computer Supported Cooperative Work in Design, Nanjing, China, 1-6, 2006.

[13.] E. Pejman, Y. Rastegari, P. MajlesiEsfahani, A. Salajegheh "Web Service Composition Methods: A Survey" proceeding of the international Multi Conference of engineers and computer scientists 2012 Vol I,IMECS 2012,March 14-16, 2012,HongKong.

[14.] Y. Charif, N. Sabouret "Dynamic service composition enabled by introspective agent coordination", Auton Agent Multi-Agent Syst., pp. 54-85, 2013.

[15.] http://www.dialogic.com/media/products/docs/whitepapers/12023-cloud_computing wp.pdf.

[16.] http://www.thinkgrid.com/docs/computing-whitepaper.pdf.

Formation of Pseudo-Random Sequences of Maximum Period of Transformation of Elliptic Curves

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ABSTRACT

It is considered methods of forming pseudo-random sequences for cryptographic of applications, in particular for domestic mechanisms to ensure security of information systems and technologies. We investigate the properties of pseudo-random sequences generator using the changes in the group of points of elliptic curves [according to the standard NIST SP 800-90], there are some disadvantages of test generator with respect to the properties of the formed sequences and their statistical visibility with uniformly distributed sequences. It is developed an improved method by introducing additional recurrent conversion, which allows you to create sequences of pseudo-random numbers maximum period.

Keywords: *Pseudo-Random Sequences, Elliptic Curves*

I. INTRODUCTION

The analysis and comparative studies have shown that the most effective in terms of indivisibility of molded sequences with realization of stochastic process is a method of forming pseudo-random numbers, which are based on the use of modular transformations or changes in the group of points of an elliptic curve [1-3]. The most promising are generators of pseudo-random sequences (PRS), which are built using transformations under points of an elliptic curve.

At the same time, as shown in the work [4-5] carried out studies, the main drawback of the known method of forming the PRS using transformations on elliptic curves (according to the standard NIST SP 800-90) is that it does not allow to form a sequence of pseudo-random numbers maximum period that significantly reduces its efficiency and limits the possibilities for practical use**.** Indeed applied scalar point multiplication operation of an elliptic curve and coordinates reflection of obtaining point for formation of pseudo-random numbers does not provide the maximum amount of molded sequences [4-5].

In this paper, tasked to develop a method of forming of sequences of pseudo-random numbers is due to the additional driving recursive transformation in conjunction with the use of transforms under points of elliptic curve will generate a maximum period of PRS, increasing its efficiency and expand opportunities for use in practice.

II. A KNOWN METHOD OF FORMATION OF PSEUDO-RANDOM SEQUENCES (PRS) ON THE ELLIPTIC CURVES

A method of formation of PRS, using transformations on the elliptic curves that suggested in the recommendations NIST SP 800-90, is based on the use of two scalar products of points of an elliptic curve and mapping of corresponding x-coordinates of received results into non-zero integer values [3].

The first scalar product on a fixed point P is performed in order to form the intermediate phase s_i, and it is cyclically changed at each iteration during the functioning of the corresponding generator. So the value of state s_i depends on the value of the previous state s_{i-1} (at the previous iteration) and the value of fixed point P:

$$s_i = \varphi(x(s_{i-1}P)), \quad (1)$$

where $x(A)$ – is the x-coordinate of the point A, $\varphi(x)$ – field elements mapping function into non-zero integer numbers.

An initial value of the parameter s_0 is formed with the use of initialization procedure, that includes insertion of a secret key (Key), which sets the initial entropy, and inserted key hashing with the forming of received results to the specified length of the bits. The received value *Seed* initiates the initial value of the parameter: $s_0 = \text{Seed}$.

The second scalar product on a fixed point Q is performed in order to form an intermediate state r_i . This scalar product sets the value of generated pseudo-random bits after the corresponding conversion. The value of parameter r_i depends on the first scalar product of parameter s_i and the value of fixed point Q :

$$r_i = \varphi(x(s_i Q)) . \quad (2)$$

The value r_i is initial for forming of pseudo-random bits. These bits are formed by reading of the block with the least significant bits of number r_i .

PRS is formed by a concatenation of read-in bits of generated numbers r_i .

The values of fixed points are set as constants. They are not changed during the forming of PRS.

The structure chart of PRS generator with the use of conversions on the elliptic curves in accordance with the recommendations of the standard NIST SP 800-90 is shown in a Fig. 1.

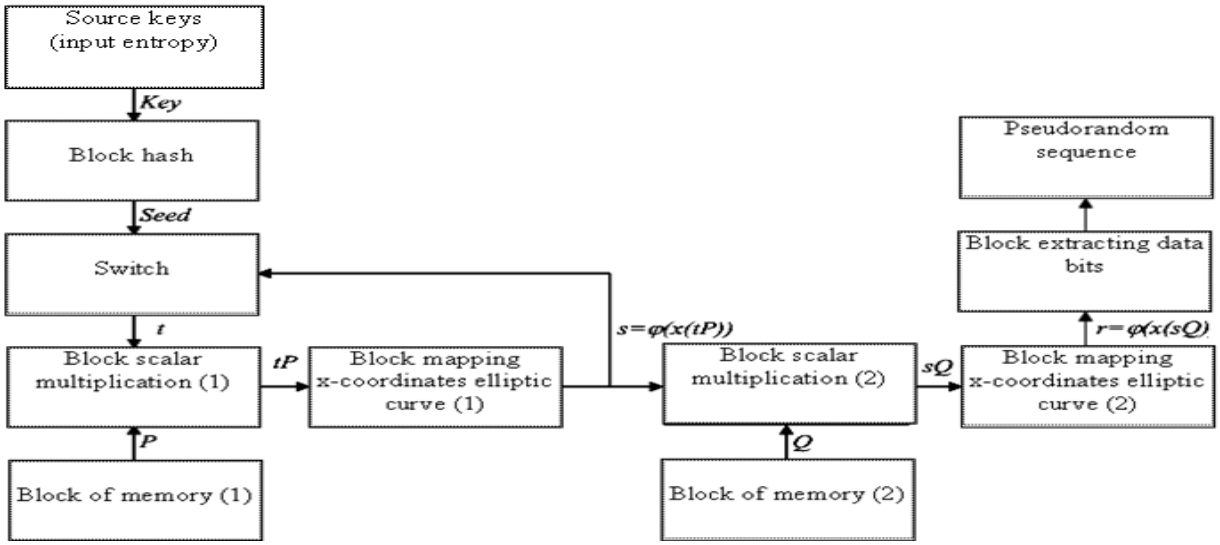

Fig. 1. The structure chart of PRS generator with the use of conversions on the elliptic curves (according to the recommendations of the standard NIST SP 800-90)

This method of PRS forming applies conversion in a cluster of points of an elliptic curve in order to form intermediate states s_i and r_i . The back action, or in the other words forming of s_{i-1} by the known s_i and/or forming of s_i by the known r_i is connected with a solution of a difficult theoretical task of discrete logarithm in a cluster of points of an elliptic curve.

Generator's intermediate states formation chart is represented in a Fig. 2.

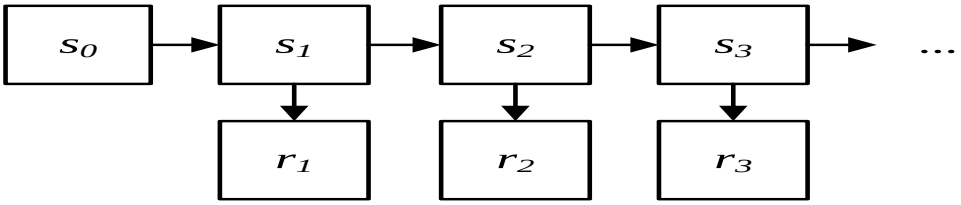

Fig. 2. Generator's intermediate states formation chart

As it is seen from the Fig. 2, the sequence of states $\dots s_{i-1}, s_i, \dots s_{i+1} \dots$ forms from the initial value $s_0 = \text{Seed}$, which in turn forms from secret key (Key), data. Each following value s_i depends on previous value of s_{i-1}, and forms by the instrumentality of elliptic curve's basic point scalar multiplication according to formula (1).

Some bits of PRS is formed by reading bit of sequence of numbers $\dots r_{i-1}, r_i, r_{i+1}, \dots$, i.e. by reading data from the result of another scalar multiplication of the base point on the value of states $\dots s_{i-1}, s_i, \dots s_{i+1} \dots$ according to the formula 2.

Since the secret Key, which sets the results for forming sequences after certain transformations determines the initial value of the parameter s_0, relevant sustainability of considered generator is based on the reduction of the problem of secrete key data recovery solutions to well-known and highly complicated mathematical task of discrete logarithm in the group of points of an elliptic curve. Besides fragments PRS also linked by scalar multiplication of elliptic curve points, i.e. to recover any piece of PRS by any other known fragment to solve the problem of discrete logarithm in an elliptic curve group.

The paper [4-5] studied the properties of periodic reporting generator PRS, including a comparison of the obtained lengths of the periods of sequences with maximum period that can be obtained for given length of keys and groups of points of an elliptic curve.

For maximum period of molded PRS take the meaning [4-5]:

$$L_{max} = \min(L_{max}(K), L_{max}(S), k), \tag{3}$$

where::

$$L_{max}(K) = 2^{l_K} - 1,$$

l_K – the length of secret key (bits);

$$L_{max}(S) = 2^{l_S} - 1,$$

$l_S = \log_2(\text{Seed})$ – bit length of meaning Seed;

k – order of point P of elliptic curve.

The generated sequences will reach the maximal period, when the elements of the sequence:

$$r_0, r_1, \dots, r_{i-1}, r_i, \dots r_{i+1}, \dots, r_{L-1}, r_0, r_1, \dots, \tag{4}$$

will possess each:

$$\min(2^{l_K} - 1, 2^{l_S} - 1, k)$$

non-zero value.

Practically it means, that the field elements mapping function $\varphi(x)$ into non-zero integer numbers at each i iteration for each generated point $s_{i-1}P$ is to generate unique integer number. But it is impossible. The order m of the group H_{EC} of the elliptic curves' points, which are used in cryptographic additions in cases, provided by the recommendations of standard NIST SP 800-90, is limited by the form:

$$p + 1 - 2\sqrt{p} \le m \le p + 1 + 2\sqrt{p},$$

where p is the order of simple Galois field GF (p) over which the elliptic curve is considered.

So the cases, when the order of cluster of points can be higher than the order of Galois field, can emerge. Practically it means that for some elements of the group H_{EC}, for example the function $\varphi(x)$ will return identical value for points P_i i P_j, $P_i \ne P_j$.

In this case the use of elliptic curves' arithmetic in the generator of pseudorandom numbers will mean the equality of states' values $s_i = s_j$ for some $i \ne j$, where:

$$s_i = \varphi(x(s_{i-1}P)) = \varphi(x(P_i))$$

and

$$s_j = \varphi(x(s_{j-1}P)) = \varphi(x(P_j)),$$

and $|i - j| < L_{max}$.

So the value of real periods L of generated consequences of states (4) will be lower than maximal period (3). But in this context we should consider the existence of negations for each element of the group H_{EC}. It means that for each point $P_i(x_i, y_i) \in H_{EC}$ exists the point $-P_i(x_i, -y_i) \in H_{EC}$, and its x-coordinate coincides with the point $P_i(x_i, y_i)$, and y-coordinate is inverse to corresponding y-coordinate of the point $P_i(x_i, y_i)$ relative to the operation of the addition in the Galois field $GF(p)$ arithmetic. The points of zero y-coordinate (the points of type $P_i(x_i, 0) = -P_i(x_i, 0) \in H_{EC}$) are the exceptions. In this case the mapping function $\varphi(x)$ of x-coordinate of the point P into non-zero integer numbers will return identical values, like in cases $P = P_i(x_i, y_i)$ and $P = -P_i(x_i, -y_i)$,so we will have the next case:

$$\varphi(x(P_i(x_i, y_i))) = \varphi(x(-P_i(x_i, -y_i))),$$

And equality correspondingly:

$$s_i = \varphi(x(P_i(x_i, y_i))) = \varphi(x(-P_i(x_i, -y_i))) = s_j.$$

Practically in means that according to the rule of PRC generating with the use of arithmetic of elliptic curves, that is described in the recommendations of the standard NIST SP 800-90 , the maximal periods of sequences will not be reached. Furthermore the experimental studies [4, 5] show that real periods will be lower than maximal.

III. DEVELOPMENT OF IMPROVED METHOD OF PRS GENERATING OF THE MAXIMAL PERIOD WITH THE USE OF TRANSFORMATIONS ON ELLIPTIC CURVES

The task of providing maximal period of generated PRS is solved by the additional recurrence transformations into the generator.

A structure chart of an improved PRS generator with the use of transformations on the elliptic curves is shown in a Fig. 3.

The first scalar multiplication on a fixed point P, like in the generator, that meets the recommendations of NIST SP 800-90, is performed in order to form an intermediate state S_i. And it is cyclically updated at each iteration during the functioning of the corresponding generator. But there is a fundamental difference. It is a forming process of this intermediate state. The improved method proposes to use a recurrence transformation, which initiates by a secret key insertion (Key), in order to provide a maximal period of sequences $\ldots s_{i-1}, s_i, \ldots s_{i+1} \ldots$

So every next state value S_i depends not only on the previous state value s_{i-1} (at previous iteration) and on the value of a fixed point P, but also it depends on the result of recurrence transformation ($LRR(y)$):

$$s_i = \varphi(x((s_{i-1} + LRR(y))P)),$$

where $x(A)$ is x-coordinate of the point A, $\varphi(x)$ is a mapping function of the field elements into non-zero integer numbers.

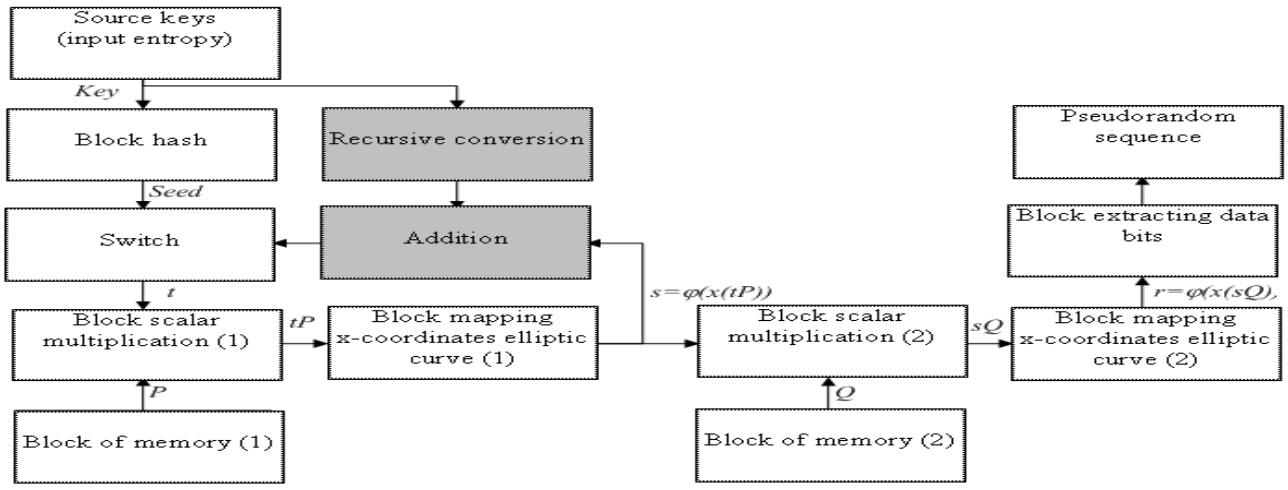

Fig. 3. A structure chart of the improved PRS generator with the use of transformations on the elliptic curve

A recurrence transformation can be built in different ways. The simplest way is the use of a circuit of linear recurrence registers (LRR) with a feedback (Fig. 4). The taps of the chain are set by coefficients of polynomial with binary coefficients

$$g(x) = g_0 + g_1 x + g_2 x^2 + \ldots + b_m x^m .$$

If the polynomial $g(x)$ is primitive over Galois field $GF(2^m)$, so the sequence, which is formed by LRR with the corresponding logic of a feedback, has a maximal period $2^m - 1$. The secret key value (Key), that initiates the work of $LRR(y)$, is written down into LRR as an initial value of the register.

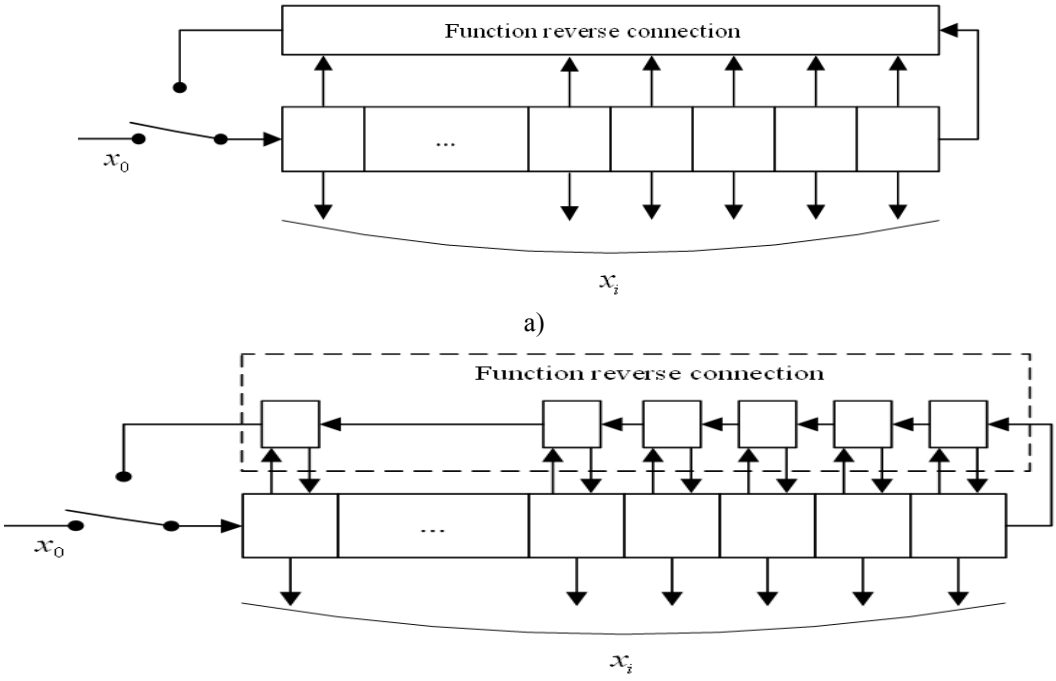

Fig. 4. A structure chart of a block of recurrence transformations with the use of LRR in Fibonacci configuration (a) and Galois configuration (b)

Devices represented at the chart №4 have the following principle of operation.

First of all initialization procedure is held. During this procedure the key of the devices is in a lower position; the initial value y_0, which is equal to the value of a secret key $y_0 = Key$, is put down into a shift register. Then the key switches on an upper position, that is mean that nothing goes to a shift register. During the work of the block the information, kept in a shift register, shifts to the right for one cell. And in the feedback circuit a value of feedback function goes to the first cell. So at i time interval the value of y_i is kept in a shift register and this value of y_i is read as a value of the function $L(y_i)$.

The feedback function provides the generating of PRS of the maximal period; it also sets a concrete look of a commutation of a feedback circuit.

According to the charts of the devices at the Fig. 4, at each step only the value of the last left cell is changed in the linear register under the Fibonacci configuration.

In the linear register under the Galois configuration at each step the values of all cells, which take part in a generating of the value of feedback function, are changed.

The main point of the improved method of PRS generating is that the key sequence is represented as a vector x_0, which initializes an initial value of an argument of a scalar product function of a point of elliptic curve $f(x) = x \cdot P$, where P is a point of the elliptic curve, that belongs to a cluster of points EC_n of multiple of N, and the initial value of y_0 of recurrence transformation $L(y)$, which is implemented for example with the help of linear recurrence registers with a feedback.

The next value x_i of an argument of a function $f(x)$ is calculated with the help of recurrence transformation (which is implemented for example with the help of linear recurrence registers with a feedback), with the help of devices of the scalar multiplication x_{i-1} on a fixed point P:

$$P'_i = (x_{i-1} + L(y_{i-1})) \cdot P,$$

and transformation $\varphi(P'_i)$ coordinates of the received point $P'_i \in EC_n$ with the help of the corresponding devices (for example x_i can be equal to the value of the coordinates of the point P'_i), so

$$x_i = \varphi(P'_i) = \varphi(f(x_{i-1} + L(y_{i-1}))) = \varphi((x_{i-1} + L(y_{i-1})) \cdot P).$$

The received values of x_i are represented as an argument of a function of scalar product of an elliptic curve point

$$f'(x) = x \cdot Q,$$

where Q is a point of an elliptic point, which belongs to a cluster of points EC_n of multiple of N.

Parent elements of sequence pseudorandom numbers forms by reading the meaning of scalar product function with the aid of corresponding devices, that is required sequence of length bit m will be the sequence:

$$b_0 \quad b_1 \quad b_2 \quad \dots \quad b_i \quad \dots \quad b_{m-1}, \; i = \overline{0,(m-1)},$$

where b_i – is a lower bit of number z_i,

$$z_i = \varphi(f'(x_i)) = \varphi(x_i \cdot Q).$$

The problem calculus of function $f(x)^{-1}$, which is inverse to the elliptic curve's point scalar product function $f(x) = x \cdot P$, that is calculation of some sense of x_{i-1} when x_i is known, is nagging theoretical-complicated problem of taking the discrete logarithm in cluster of points of elliptic curve. Conformably the problem of calculation the function $f'(x)^{-1}$, which is inverse to the elliptic curve's point scalar product function $f'(x) = x \cdot Q$, that is calculation of some sense of x_i when z_i is known, , is nagging theoretical-complicated problem of taking the discrete logarithm in cluster of points of elliptic curve. The effective logarithms of calculation discrete logarithms for basis points of large-scale order for resolution of this problem are rested unknown for today. That's why this way of formation of sequence of pseudorandom numbers is cryptographically resistant. Formally, the formation of PRS when the linear recurrent registers are used (indicated as LRR) could be shown in such a way.

Secret key: Key;

Constants: P, Q – points EC of the multiple of n;

Initial condition: $x_0 = Key, y_0 = Key$;

Cycle function:

$$\varphi(f(x + LRR(y))) = \varphi((x + LRR(y))P),$$

$$LRR(y = \{u_1, u_2, \dots, u_m\}) : u_i = -\sum_j a_j u_{i-j} + u_i$$

where: $\{u_1, u_2, \dots, u_m\}$ – is the condition of LRR, $\{a_1, a_2, \dots, a_m\}$ – are the coefficients, which specify the function of inverse liaison of LRR, $\varphi(P'_i)$ – transformation of coordinates of point $P'_i \in EC_n$ (f.e. reading of sense of one of the points's P'_i coordintaes).

Formed PRS:

$$(b_0, b_1, \dots, b_i, \dots)$$

where b_i – the less meaningful bit (the bit of twoness) number z_i,

$$z_i = \varphi(f'(\varphi((x_{i-1} + LRR(y_{i-1}))P))) = \varphi(\varphi((x_{i-1} + LRR(y_{i-1}))P)Q),$$

$$y_i = LRR(y_{i-1}).$$

To analyze periodical properties of enhanced generator PRS, let us consider the structure chart, which is shown at the Fig. 3.

The initial value of parameter S_0, as it is in the generator, which corresponds to the recommendations of NIST SP 800-90, forms with the use of initialization procedure, which includes the enter of secret key (Key), which defines the initial entropy (ambiguity), and hashing of the key entered with formatting of received result to concrete length of bits. Received sense Seed initiate the starting value of the parameter: $s_0 = Seed$.

The second scalar multiplication on a fixed point Q is performed in order to form an intermediate state r_i, which after the corresponding transformation set the value of the generated pseudorandom bits. Every next value of the state s_i depends on the results of an implementation of a recurrence transformation $LRR(y)$, which provides a maximal period of generated sequences, so the value of parameter r_i, that depends on the parameter S_i and the value of the fixed point Q: $r_i = \varphi(x(s_i Q))$, will depend on the results of results of an implementation of a recurrence transformation $LRR(y)$, so the generated sequence of states $\dots r_{i-1}, r_i, r_{i+1}, \dots$ will have a maximal period.

The received value r_i is an initial for generating of pseudorandom bits, which are generated by reading of block from the least significant bits of generated numbers r_i. PRS is generated by concatenation of read-in bits of generated numbers r_i. The values of fixed points are defined as constants and during PRS generating they don't change.

So the periodic features of states of the improved generator are defined by the periodic features of an additional recurrence transformation $LRR(y)$.

On the Fig. 5 we see an original sequence $LRR(y)$, indicated by $\dots y_{i-1}, y_i, \dots y_{i+1} \dots$ We sketch the influence of periodicity of this sequence on periodicity of sequences $\dots s_{i-1}, s_i, \dots s_{i+1} \dots$ and $\dots r_{i-1}, r_i, r_{i+1}, \dots$.

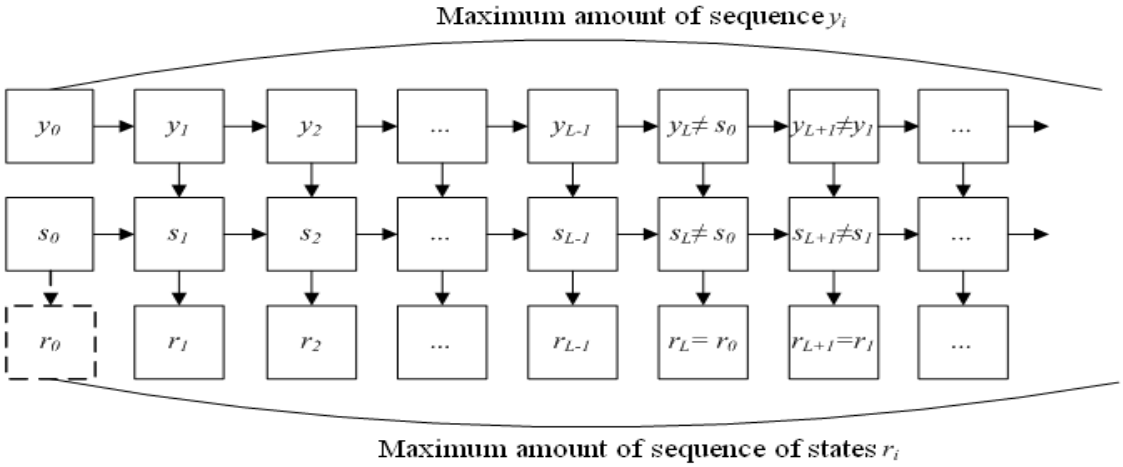

Fig. 5. The chart of forming of state sequences of the generator with maximal period

The periodic features of sequences $\dots s_{i-1}, s_i, \dots s_{i+1} \dots$ and $\dots r_{i-1}, r_i, r_{i+1}, \dots$ depends on features of sequences $\dots y_{i-1}, y_i, \dots y_{i+1} \dots$, so the use of recurrence transformation $LRR(y)$ with the maximal period of the original sequences provides the maximal period of the original sequence.

The additional recurrence transformations, which are implemented with the help of linear recurrence registers with feedbacks, help to form sequences of pseudorandom numbers of maximal period. It helps to increase the efficiency and widen the practical use.

IV. CONCLUSIONS

During the research of PRS generator on the elliptic curves, which is described in a standard NIST SP 800-90, we found out further shortcomings: a cyclic function of the generator, that provides the maximal period of the generated PRS of the inner states and the corresponding points of the elliptic curves, is not defined; the forming of PRS bits from the sequence of the elliptic curve points by a sample of a block with the least significant bits and its concatenation doesn't meet the requirements of the statistical discrepancy with uniformly separated sequence. So the PRS generator on the elliptic curves (NIST SP 800-90) doesn't meet the requirements sufficiently.

The improved method of forming PRS of the maximal period with the use of transformations on elliptic curves was elaborated during the research. This method unlike the others helps to generate sequences of pseudorandom numbers of the maximal period and it increases the efficiency and widens the practical use.

The elaborated method is based on the bringing of a task of a secret key finding to the solving of a difficult theoretical task of a discrete logarithm in a cluster of points; it also helps to form PRS with a maximal period.

An introduced method of forming of PRS with maximal period with the use of transformations on elliptic curves removes the uncovered drawbacks of the generator described in the standard NIST SP 800-90: it was proposed to use linear recurrence transformations, which help to form a maximal period of sequences of inner states and corresponding points of an elliptic curve; forming of an original PRS by reading of one the least significant bit from coordinates of elliptic curve points meets the requirements of a statistical safety.

So the introduced method of PRS forming meets modern requirements and can be used in order to improve different safety mechanisms for an information security of telecommunications networks and systems. Prospective course of a further research are the argumentation of practical recommendations concerning a realization of the introduced PRS and the ways of its use in different mechanisms of an information security of telecommunications networks and systems.

REFERENCES

[1] Alfred J. Menezes, Paul C. van Oorschot, Scott A. Vanstone. Handbook of Applied Cryptography – CRC Press, 1997. – 794 p.
[2] Final report of European project number IST-1999-12324, named New European Schemes for Signatures, Integrity, and Encryption, April 19, 2004 – Version 0.15 (beta), Springer-Verlag, 829 p.
[3] Elaine Barker and John Kelsey, Recommendation for random number generation using deterministic random bit generators, National Institute of Standards and Technology, January 2012, 124 p. http://csrc.nist.gov/publications/nistpubs/800-90A/SP800-90A.pdf
[4] L.S.Soroka, O.O.Kuznetsov, D.I.Prokopovych-Tkachenko. The features of the generators of pseudorandom sequences on the elliptic curves. // the bulletin of Ukrainian Academy of Customs. Edition "Technics", №1 (47), 2012. – p. 5-15.
[5] L.S.Soroka, O.O.Kuznetsov, D.I.Prokopovych-Tkachenko. The research of the generators of pseudorandom sequences on the elliptic curves // An implementation of information technologies for training and activities of law-enforcement agencies: theses of reports from theoretical and practical conference of Academy of internal military forces of Ministry of internal affairs of Ukraine, March 21-22, 2012. – H.: Academy of internal military forces of Ministry of internal affairs of Ukraine. – 2012. – p. 47 – 49.

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Block Mathematical Coding Method of Images Compressed by a SPIHT Algorithm

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ABSTRACT

A method of mathematical block mathematical coding of images compressed by a SPIHT algorithm is developed in the article. Redundancy of information during encoding by a SPIHT algorithm that can further compress the information by entropy coding is identified. An optimization equation which enables us to find an optimal block size for the application in the block mathematical coding is obtained.

Keywords: *compression, image, SPIHT, mathematical coding, block, network*

I. INTRODUCTION

Works [1, 2] show the need for progressive compression of multimedia content, to improve the performance of telecommunication systems and networks. The introduction into telecommunications systems' and networks' infrastructure of intermediate servers of information repacking will significantly reduce the optional content traffic, which will be initially delivered in a lowered quality, and will finish loading to displaying in a full quality if needed only. The existing systems can display only fully accepted piece of multimedia information, which can lead to a complete neglect of an incomplete fragment. An approach proposed in [1, 2] solves a problem of the service denial, which is to display multimedia content without delays, with quality comparable to the amount of the received information. However, the proposed approach may be improved by using a higher multimedia information compression ratio while maintaining the quality of multimedia traffic. The presented article is devoted to solving this problem.

II. COMPARISON OF BIT DENSITIES BY USING DIFFERENT METHODS OF ENCODING INFORMATION

The main methods that claim to be used in a system of intermediate recompression are JPEG2000 and SPIHT. However, the redundancy of information in a packed SPIHT image has a greater degree. This can be shown by calculating the information entropy of the image packing result. Taking into consideration that the coding of both methods is bitwise, we establish a ratio between a unit and a zero bit. The values of ratios may for convenience be taken for each kilobyte of a file, Fig. 1, 2, 3.

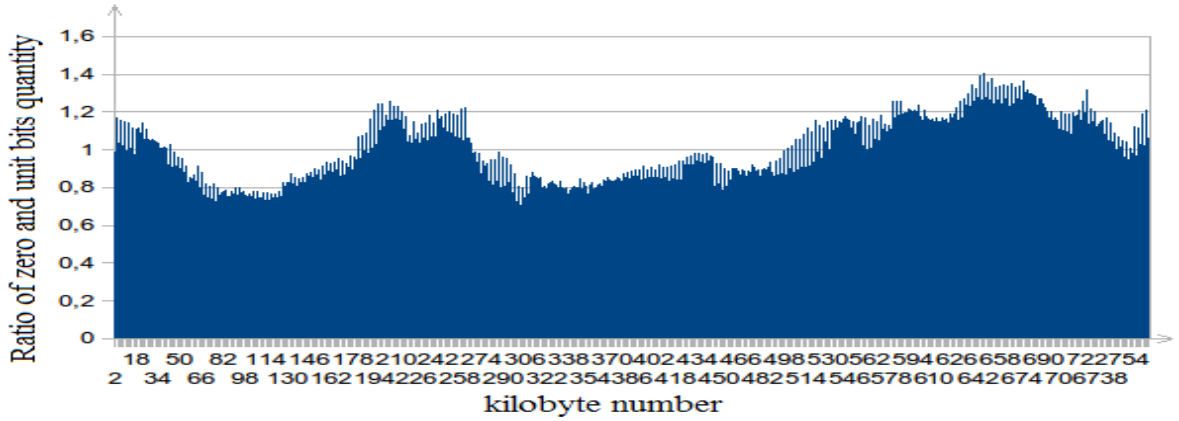

Fig. 1. The ratio between the quantity of a zero and unit bits for the encoded image bmp

The test result shown in Figure 1. graph demonstrates the uneven distribution of zero and unit bits in the source non-coded image. Applying an image coding by method JPEG2000 helps to get rid of redundant information that leads to a uniform probability distribution of reading of a unit and zero bit (Figure 2).

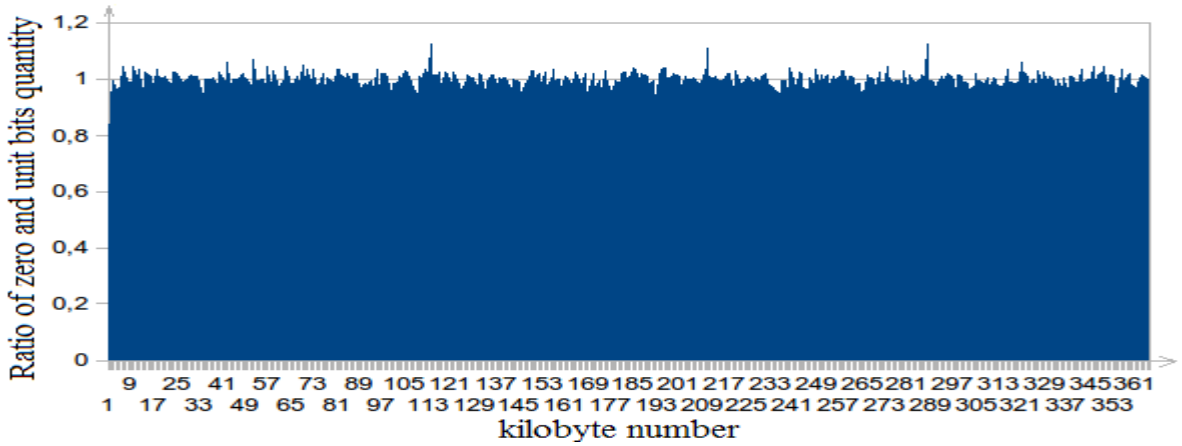

Fig. 2. The ratio between the quantity of a zero and unit bits for JPEG2000 encoded image

This indicates an absence of redundancy in compression by JPEG2000 method. Considering SPIHT coding, it can be noted that the SPIHT algorithm realizes the transmission of bit sets along the appropriate bit segments, resulting in more frequent transmission of a zero bit. Herewith, when the number of significant pixels increases a unit is transmitted more frequently (Fig. 3).

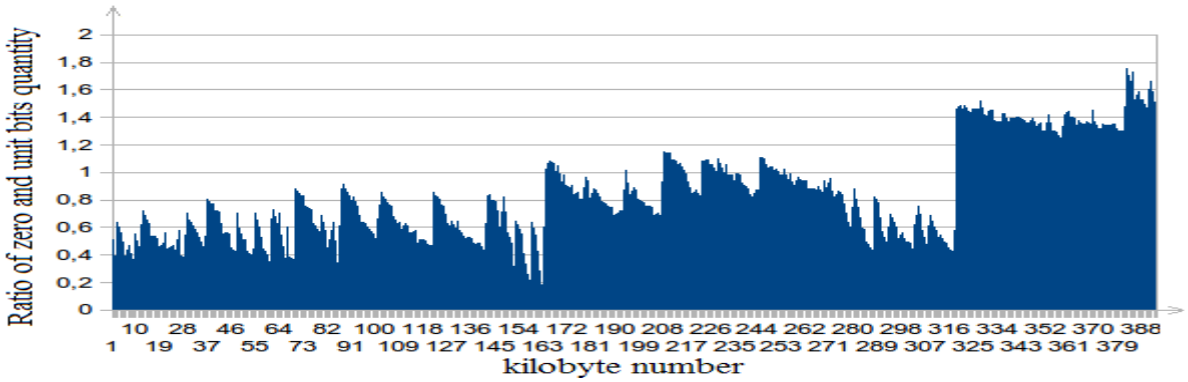

Fig. 3. The ratio between the number of zero and unit bits for the encoded image SPIHT

The situation with the uneven distribution of the ratio of zero and unit bits is the result of peculiarities of SPIHT coding and absence of additional entropy compression, which is present in JPEG2000. If we encounter a situation of uneven bit-encoding when one bit has a fractional value of a bit in the result file, mathematical implementation of compression [9, 10] is suitable, which is in alignment probability of following bit by eliminating of redundant information.

Fig. 3 shows the ratio of unit bits to zero ones, which has no constant value, and changes dramatically, not only in the transition from one bit field to another, but also from one image zone to the other. That's why the use of a constant factor for the probabilities of 0 or 1 is not suitable for receiving a minimum size of the output file. Therefore, these probabilities should vary depending on a specific local value. For adaptive arithmetic compression of information, this contains an array of a fixed number of last received data for continuous refinement of probability, for which there is a patent restriction. It is therefore necessary to provide for block coding, for which the probability of values of bits "1" or "0" is separately determined. It is necessary to determine the size of the block and set up the likelihood of a unit bit.

Let's suppose that to record the proportion of unit bits for Ni bits of a file, the recording of fixed-point sizes in b bits is used: p(1)=1-p(0). Then the size of the code within a block will be as follows:

$$N_i^* = -N_i\left[p(0)\log_2 p(0) + p(1)\log_2 p(1)\right] + b\ , \qquad (1)$$

where N^*_i is the size of a packed part; N_i, p(0) is the probability of occurrence of zero bit equal to N_{i0}/N_i; p(1) is the probability of occurrence of a unit bit equal to N_{i1}/N_i. Using the formula of determining the probabilities, let's exclude of (1) the number of unit and zero bits, leaving only the probability of a unit bit and the size of the encoded part of an image:

$$N_i^* = -N_i\left[(1-p(1))\log_2(1-p(1)) + p(1)\log_2 p(1)\right] + b \quad (2)$$

where the first summand depends on the properties of information, and the second is the introduced above constant. A full size of the file will then be the sum of the sizes of packaged blocks:

$$N^* = -\sum_{i-1}^{n} N_i\left[(1-p(1))\log_2(1-p(1)) + p(1)\log_2 p(1)\right] + n \cdot b \quad (3)$$

where n is a number of parts for image packaging. Compression ratio by entropy method depending on p(1) is shown in Fig. 4. Herewith, in the part for encoding, oscillation probabilities of occurrence of "1" can be seen, so that the degree of compression of small data fragments should give a better result. However, with the increase of the number of parts, it is necessary to use a larger amount of information to record probabilities, *nb* in formula (3).

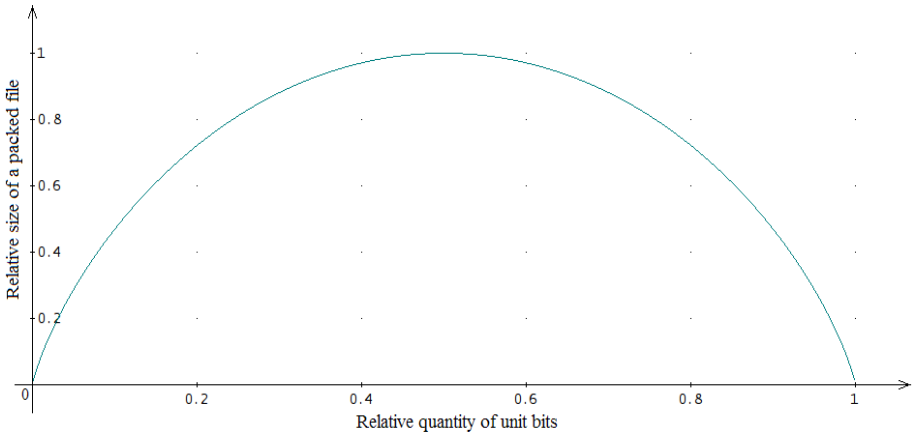

Fig. 4. The dependence of the compression ratio of the share of unit bits

This leads to an optimization problem:

$$N^*(n) = -\frac{N}{n}\sum_{i-1}^{n}\left[(1-p(1))\log_2(1-p(1)) + p(1)\log_2 p(1)\right] + n \cdot b \to \min \quad (4)$$

The sense of this optimization is a more accurate determination of the probability of occurrence of a unit bit in a code sector, but to record such information it is necessary to allocate a certain amount of information. When the number of periods n is twice increased, the amount of information for recording the coefficients also doubles. This growth must be compensated by improved image compression mode. An example of selection of the intervals is shown in Fig. 5. It is obvious, that the excessive division of the information flow on blocks, the compression ratio may decrease, and as a result a file of a larger size than the original one may be received.

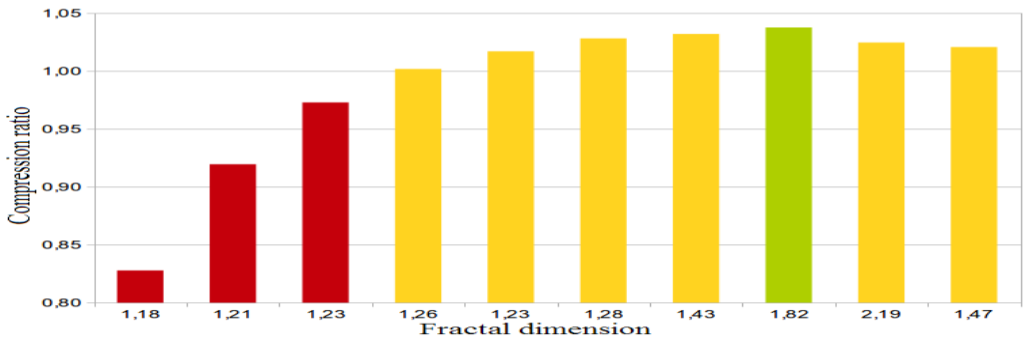

Fig. 5. An experiment of compression by blocks (vertically compression ratio, horizontally fractal dimension of a change in the estimate of probability sampling of a unite bit, intervals changed twice)

We may decide on further reduction of the blocks with generalized information about the proportion of unit bits from the analysis of formula (2). Let's suppose that the block size is halved with the notation:

$$p_{2i,2n}(1) = p_a, p_{2i+1,2n}(1) = p_b, p_{i,n} = p, \qquad p = \frac{p_a + p_b}{2}.$$

One can understand how the degree of compression of one block is changed from the following correlation:

$$K = \frac{2\left(p \log_2(p) + (1-p)\log_2(1-p)\right)}{p_a \log_2(p_a) + (1-p_a)\log_2(1-p_a) + p_b \log_2(p_b) + (1-p_b)\log_2(1-p_b)}, \tag{5}$$

where $K(p_a,p_b)$ is symmetric relatively to the arguments function which is equal to 1, with $p_a=p_b$, which means there is no change in the size of compressed information. In this case, there will be no benefit from partitioning the data stream into smaller parts. When $p_a \neq p_b$, then $K>1$, and this (Fig. 6) means a decrease of the initial amount of multimedia data, which will be sent to the telecommunication network.

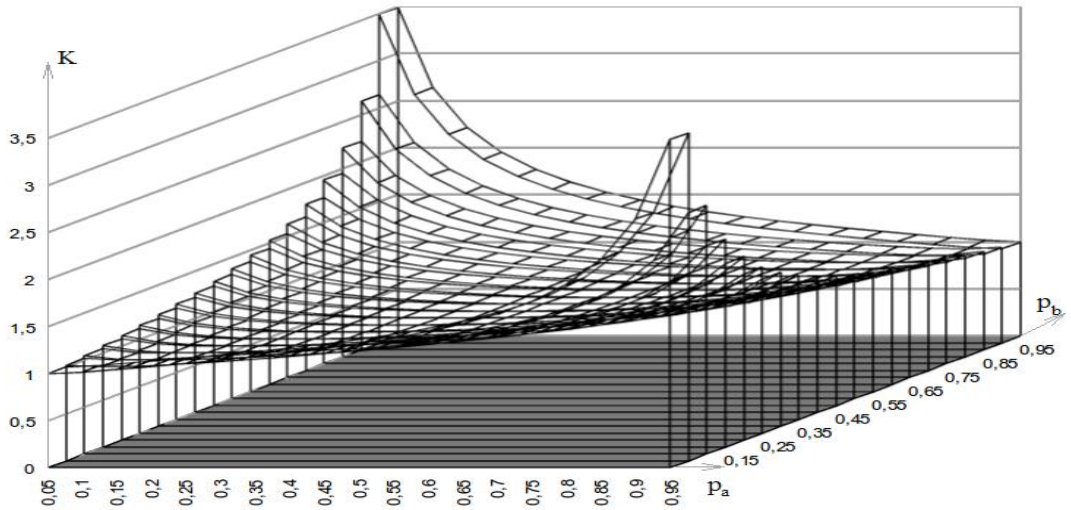

Fig. 6. The dependence of the coefficient of the information K amount reduction while splitting the block of coding $p=p_a+p_b$

In Figure 6, with the schedule $K(p_a,p_b)$ it can be seen that the degree of information compression is greatly increased at the maximum difference between p_a and p_b. For making a decision to reduce encoding blocks, it is necessary to have an estimate of $|p_a-p_b|$. The evaluation may be performed with the help of the concept of fractal dimension of a numerical sequence [11] (Fig. 7, 8).

1. Fractal dimension F is close to 2 (Fig. 7). As the number of reports of the curve increases, the curve gradually fills the plane – new fractures commensurate with the scale of the previous ones. As a consequence, we get the high compression ratio from (4).
2. Fractal dimension of F is close to 1 (Fig. 8). In this case, the specified curve will almost repeat the previous one, and specifying the probability of a sample unit to increase the information compression rate will not succeed.

For a sequence of probabilities $\{p_0,p_1,...,p_{2n-1}\}$ on larger blocks we'll get a set of probabilities:

$$\{(p_0+p_1)/2,(p_2+p_3)/2,...,(p_{2n-2}+p_{2n-1})/2\}$$

at a conditionally unit interval. The lengths of the curves for the first and second sequences are as follows:

$$L_1 = \sum_{i=0}^{n-1} \frac{p_{2i} + p_{2i+1}}{2} \cdot \frac{1}{n}, \qquad L_2 = \sum_{i=0}^{2n-1} p_i \frac{1}{2n}.$$

A local fractal dimension of the curve will be:

$$F(n) = \log_2(L_2/L_1).$$

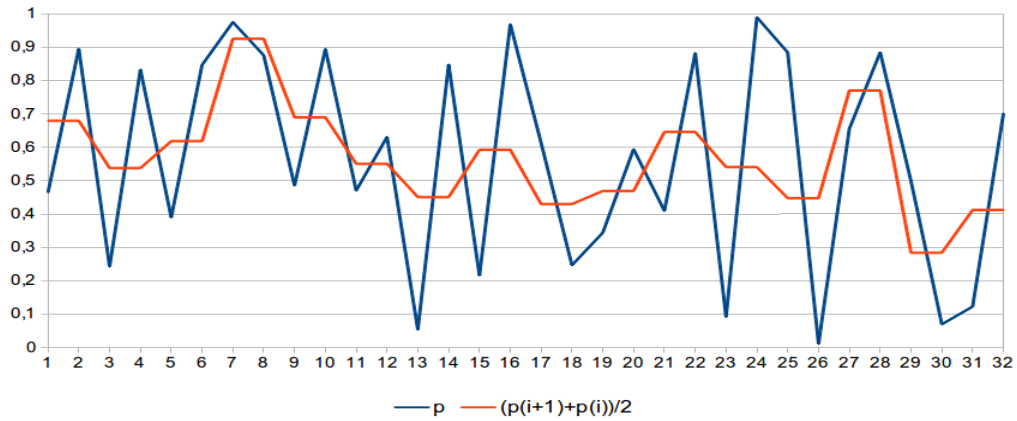

Fig. 7. Clarification of a line with the fractal dimension 1.8

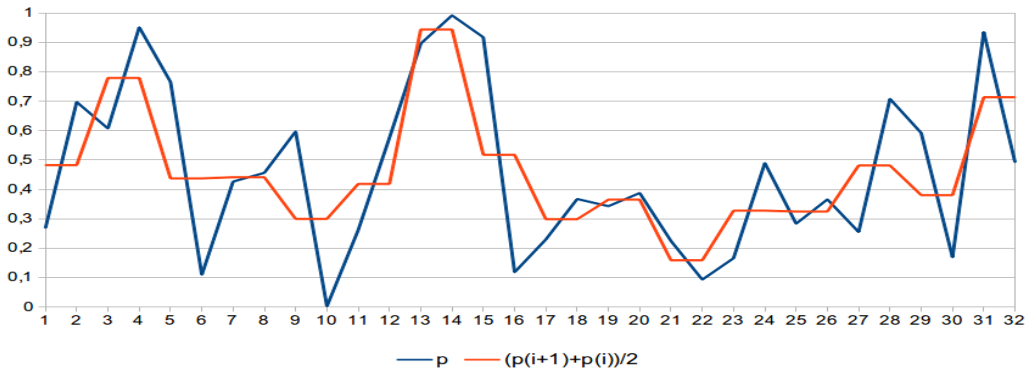

Fig. 8. Clarification of a line with the fractal dimension 1.12

In order to determine the fractal dimension to evaluate the improvement of data compression, we consider two extreme cases:

The dimension is understood here as the number of F, which shows to what extent a should be raised to get a coefficient of the curve elongation, having reduced the "line" at a times. With a length of L, the line has n segments of $\{(p_i,i/n);(p_{i+1},(i+1)/n)\}$. The average length of one segment will be $<L>=L/n$. When the number of blocks increases from n_1 to n_2 ($n_1<n_2$), the line lengthening will be approximately equal to $L_2 \approx L_1(n_2/n_1)^F$ and $<L2>=L_1(n_2/n_1)^F/n_2$. Here and below, the notation <L> is used for an expected value. Finally, the average difference between the successive values of probabilities of unit bits emergency will be:

$$\langle|\Delta p_2|\rangle = \langle|\Delta p_2|\rangle\left(\frac{n_2}{n_1}\right)^{F-1}. \tag{6}$$

For the initial breakdown of bits sequence which consists of n_1 segments of the fractal dimension F switched to a breakdown of $n_2=zn_1$ segments. It follows from (6) that:

$$\langle|\Delta p_2|\rangle = \langle|\Delta p_2|\rangle z^{F-1}. \tag{7}$$

The meaning of this expression is in a constant increase in the density difference of unit bits to tackle increasingly shorter subsequences from the main sequence. An increase of the compression ratio K to some limit follows from the correlations (5) and (7). The most pessimistic estimate of the compression ratio change will be if we take p=0,5, $p_a=p-\Delta p/2$, $p_b=p+\Delta p/2$ (Fig. 6):

$$K(F,z) = \frac{n \log_2 0{,}5}{\sum_{i=1}^{n}\left[\left(0{,}5+z^{F-1}/2\right)\log_2\left(0{,}5+z^{F-1}/2\right)+\left(0{,}5-z^{F-1}/2\right)\log_2\left(0{,}5-z^{F-1}/2\right)\right]} \tag{8}$$

However, adding each block with the information about unit bits share, more information of size zb is needed. The optimization task (4) is reduced to finding a minimum of an equation with one kind of variable z:

$$N \cdot K(F,z) + zb \rightarrow \min. \tag{9}$$

The objective function (9) is not linear, so its minimum is sought by numerical methods. The problem is quickly solvable because z can take only integer values and (9) has only one minimum because of monotony (8) and a summand zb.

III. CONCLUSIONS

As a result of the research, a method of mathematical block coding of images compressed by an algorithm SPIHT has been developed. In developing this method, the following results were obtained:

1. The results of image compression based on wavelet transformation of JPEG2000 and SPIHT are examined.
2. The presence of redundant information while using SPIHT coding is shown.
3. The degree of compression of SPIHT code with the help of a block arithmetic compression is investigated.
4. A weighting function which allows receiving the size of the block on which the probability of getting a single bit is taken by a constant is obtained.
5. An algorithm allows correct restoring of non-fully received information that retains the properties of the progressive image transmission.

REFERENCES

[1] Dreyev O.M. The method of unloading of telecommunication server by caching of images // Scientific proceedings of Kirovohrad National Technical University "Technology in agriculture, industry machinery, automation." Issue 25. Part I. Kirovograd 2012. - P. 419-4242;

[2] Dreyev O.M., Smirnov A.A., Meleshko Y.V., Kovalenko O.V. The method of forecasting of a telecommunication network server workload // Information processing systems, Issue 3 (101), Vol. 2, Kharkov 2012 - P. 181-188;

[3] Dreyev O.M. Improving of SPIHT coding visual quality at a high compression of video images // Materials of the twelfth scientific workshop Combinatorial configurations and their application. October 14-15, 2011. Kirovograd;

[4] Balashov K.Y. Data reduction: an analysis of methods and approaches. // Minsk, 2000. – 42 p. (Preprint/Institute of tech. Cybernetics of Byelorussia National Academy of Sciences; № 6);

[5] Salija.p, Manimekalai M.A.P, Dr. N.A Vasanti. Content based image compression techniques: a survey // International Journal of Science, Engineering And Technology Research (IJSETR). Volume 2, Issue 3, March 2013;

[6] Ning Zhang, Longxu Jin, Yinhua Wu, Ke Zhang "An improved fast SPIHT image compression algorithm for aerial applications"// Journal of Multimedia, vol. 6, no.6, December 2011;

[7] Muna F. "Medical Images Compression Using Modified SPIHT Algorithm and Multiwavelets Transformation" Computer and Information Science Vol. 4, No. 6; November 2011;

[8] K. Nagamani, A.G .Ananth "EZW and SPIHT image compression techniques for high resolution satellite imageries" International Journal of Advanced Engineering Technology (IJAET) Vol. II, Issue II, April-June, 2011/82-86;

[9] Salomon, David (2008). A Concise Introduction to Data Compression. Berlin: Springer;

[10] Guy E. Blelloch. «Introduction to Data Compression» January 31, 2013 blellochcs.cmu.edu;

[11] Robert Strichartz, Differential equations on fractals: a tutorial. Princeton University Press, 2006 - 169 p.

[12] Sklar B., Digital Communication. Theoretical Basis and Practical Application. – M. Williams, 2003. – 1104 p.

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Fast Encryption Algorithm for Streaming Video over Wireless Networks

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ABSTRACT*:*

Wireless networks are poised to enable a variety of existing and emerging video streaming applications.

However, video streaming over wireless suffers from piracy and malicious attack. Also, it is well-known that video decompression on the handheld devices is constrained by the power and other computation resource. Therefore, video encryption should be designed to be lightweight and efficient. In this paper, we designed a new lightweight, efficient, scalable, format-compliant video encryption algorithm, which is based on the DCT (Discrete Cosine Transformations) coefficients scrambling. The simulation shows that the proposed video encryption algorithm consumes low computation resource while achieves high scalability and confidentiality, which is in compliance with the design goal of video streaming over wireless applications.

Keywords— *video, encryption, security, wireless networks*

I. INTRODUCTION

Advances in multimedia and wireless technologies have led to the recent wide deployment of streaming video over wireless applications and services that suffer from piracy and malicious attack. The security becomes a critical issue in the design and development of such multimedia applications. Assuring a certain level of security is a strong requirement for a large deployment of multimedia applications. Failure to meet security requirement poses potential threats to the service providers and customers. Encryption for the video bit stream should be designed to be lightweight and format-compliant. Since video decompression on the handheld devices is constrained by the limited power and other computation resources, conventional ciphers such as data standard encryption (DES) or advanced encryption standard (AES) to wireless applications over handheld devices are intensive computation tasks. Therefore, it is not efficient to apply conventional ciphers for wireless multimedia applications. Selective encryption algorithms are proposed to be an economical and secure video encryption algorithm where only I-frames are encrypted. However, it has been reported as not good choices in the encryption of digital video since encrypting I-frames alone may not be sufficiently secure for digital video [1]. Compression-Logic based encryption is widely studied and several algorithms have been proposed [2,3,4,5,6,7,8,9,10,11]. However, these compression-based algorithms suffer either vulnerability or low-efficiency problem. In this paper, a new compression-based video encryption algorithm is proposed. The new algorithm overcomes the reported vulnerability and at the same time, relatively low computation complexity, low compression overhead, high scalability are maintained. Also, the new algorithm confines the encryption-incurred error propagation. Quick recovery from bit errors and fast resynchronization from packet losses are feasible..

II. RELATED WORK

The output of video compression is a sequence of three types of frames: I-frame (Intra picture), P-frame (Forward Predicted) and B-frame (Bidirectional Predicted: Forward-Prediction and Backward-Prediction). I-frame is reference frame and is self-contained. A P-frame specifies the difference between the previous I-frame and itself; while a B-frame is an interpolation between the previous and subsequent frame of I or P type. To compress an I-frame, the process starts from dividing the frame into macro-blocks. Each macro-block is of size 16×16 pixels. And each macro-block is composed of six blocks, four of them represent luminance and the other two represent chrominance. Each block of size 8×8 is through a discrete cosine transformation.

The transformed DCT (Discrete Cosine Transformation) coefficients are uniformly quantized in conjunction with a pre-defined quantization table. The quantized DCT coefficients are arranged in accordance with a zig-zag order. Finally, the zig-zag sequence is compressed by the Run Length Encode (RLE) mechanism to generate video bit stream. Encoding a P or B frame depends on the same block compression process and the motion compensation. The motion compensation is a technique used to compute the best-match region in the reference frame for a target macro-block in a P or B frame. The vector that points to the best-match region from the target macro-block, known as motion vector, is encoded by the Run Length Encode. Then difference or interpolation of the target macro-block and the best-match region is encoded in the same way as encoding macro-blocks of an I-frame. As we know, amplitudes of the DCT coefficients with low frequencies are relatively larger than the amplitudes of other DCT coefficients. Random permutation (interchangeably with scrambling) of coefficients of a single block does not necessarily hide those large coefficients. It has been demonstrated that video decompression based on only a few low frequency DCT coefficients could generate acceptable video playback quality. Since the low-frequency DCT coefficients with relatively large amplitudes can be easily identified after the scrambling, malicious attackers could recover significant amount of video data from cipher-text by simply performing IDCT (Inverse DCT) based on a few coefficients with relatively larger amplitudes from the permutated DCT block. The sensitivity of low frequency DCT coefficients to malicious attack is called DCT vulnerability.

Davis Pan [5] said that the MPEG compression algorithm is the first international standard for digital compression for high-fidelity audio. MPEG is one part of three part compression standard.

Tha MPEG standard addresses the compression of synchronized video and audio. Dr. S.R. Ely [6] said that MPEG has been outstandingly successful in defining the standards for video compression coding, serving a wide range of applications, bit-rates, qualities and services. The standards are based upon a flexible toolkit of techniques of bit-rate reduction. The picture quality obtained through an MPEG codec depends strongly upon the picture content, but as experience with MPEG coding grows, the bitrate needed for a given picture quality is likely to reduce.

III. VIDEO ENCRYPTION ALGORITHM

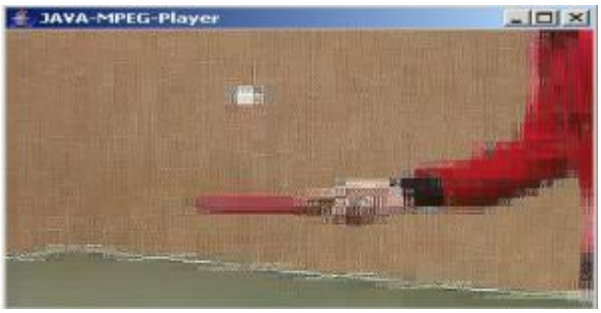

Figure 1: Before random Permutation

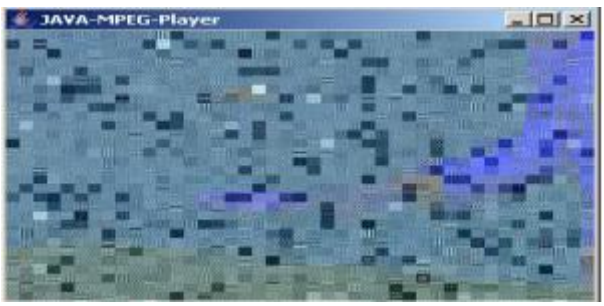

Figure 2: After random Permutation

The proposed algorithm is a Compression-Logic based video encryption algorithm. Instead of randomly permuting 8×8 coefficients of a single DCT block, the random permutation is applied to a number of permutation groups. Each permutation group contains the DCT coefficients of the same frequency (index of 8×8 DCT matrix) from every single block of a frame, regardless of I, P or B frame. Obviously, since each DCT block has 64 coefficient frequencies so that 64 permutation groups can be formed, the proposed algorithm runs random permutations on each of permutation groups to encrypt a single video frame. After random permutation, the encrypted video data is compressed by standard RLE. The resulting picture after the random permutation is shown in Figure 1(b). The idea of the random permutation is illustrated in Figure 2 by an

example. Note that blocks of a frame are indexed in row major. Figure 2 (a) shows the original DCT blocks before the random permutation. The DCT blocks after the random permutation is shown in Figure 2 (b). Figure 2 (c) shows the permutation order, which basically represents the encryption key of the proposed algorithm. Each number in Figure 2 (c) is the block index number of the corresponding coefficients in Figure 2 (a). The proposed video encryption algorithm scrambles the DCT coefficients of each permutation group. After the random permutation, the sensitive low frequency DCT coefficients still exist in the low frequency region such that the statistical distribution of DCT bock remains the same and low-frequencies DCT coefficients can not be easily identified after encryption by simply checking the amplitudes of coefficients. Therefore, the new video encryption algorithm is more secure than Tang's algorithm. The new algorithm is built on top of standard video compression scheme. It inherits most of computation steps of video compression and simply inserts permutation before entropy coding is applied. Thus no extra computational steps are introduced except encryption and decryption. The computation overhead is relatively small. In addition, since random permutation does not change DCT block statistical distribution, no compression inefficiency incurs in terms of entropy coding. The video bit stream generated by the new encryption algorithm has the same format as that of standard MPEG algorithms. Therefore, the new video encryption algorithm is format-compliant. According to the statistical distribution that high-frequency DCT coefficients tend to have zero amplitude, we know the permutation groups which include high-frequencies coefficients contain zeros mostly. Scrambling those permutation groupso does not improve data confidentiality much while the performance of the proposed algorithm is negatively impacted. It is wise to select only a small number of permutation groups with low-frequency DCT values for encryption, which further reduces the computational overhead without confidentiality breach. In summary, the advantages of the new video encryption algorithm are multi-folded. Firstly, the proposed algorithm does not suffer from DCT vulnerability. Secondly, it maintains the sam compression efficiency compared to the standard MPEG algorithms since the new algorithm has the same probability distribution of DCT coefficients after the scrambling. Thirdly, the new algorithm adds little computation overhead since the encryption and decryption has the same computational complexity as zig-zag order, which is basically linear to the number of coefficients. Furthermore, the proposed algorithm is format-compliance. Therefore, it confines the encryption-incurred error propagation. Quick recovery from bit errors and fast resynchronization from packet losses are feasible. Finally, the proposed algorithm is selective since only a small number of permutation groups can be encrypted based on the requirements of confidentiality. The proposed video encryption algorithm is extremely suitable for application of streaming video over mobile devices. As we discussed, the new algorithm guarantees the protection of source video from the exploitation of DCT vulnerability. And it is reliable against brute-force attacks due to a very large key space. Retaining format-compliance and compression efficiency makes the proposed algorithm compatible with current MPEG standards. Robustness against wireless channel error is provided by error propagation control. Selective encryption makes security protection scalable, which is necessary for user requirement and available computational resource

IV. ALGORITHM ENCRYPTION STRENGTH ANALYSIS

The new encryption algorithm can be described by the following formula:

$$Y=E(K,X)$$

Where X is the DCT coefficients before the scrambling while Y is the coefficients after the scrambling; K is the scrambling order, which represents the encryption key. To protect the algorithm from brute-force attack, the key space can be used to measure the strength of the encryption algorithm. Tang's algorithm is based on permutation of 64 coefficients of a DCT block. In theory, the key space of Tang's algorithm is factorial of 64. However, by exploiting the DCT vulnerability, the attackers can recover significant amount of video info from only a few DCT coefficients without exhaustively working through the key space in Tang's algorithm. The key space of the proposed video encryption algorithm is proportional to the frame size. For a video frame of M×N pixels, the number of luminance DCT blocks, K, can be computed as follows:

$$K= \quad \times \quad = \frac{M}{\epsilon}$$

Since the scrambling is performed on DCT coefficients of permutation group, the key size of the proposed algorithm is factorial of K. As an example, ITU QCIF (Quarter Common Intermediate Format 176×144 pixels) video has 396 luminance blocks, which means the key space for QCIF video is factorial of 396, which is much larger than that of Tang's algorithm. More importantly, as we discussed in section 4.1, the proposed algorithm does not suffer from DCT vulnerability. Therefore, it is impractical to brute-force attack the video encrypted by the proposed algorithm.

V. ALGORITHM EFFICIENCY ANALYSIS

In Tang's algorithm, the number of permutation operations performed on a single video frame is exactly the number of blocks of that frame. In the case of QCIF (176×144), permutation operation will be applied 594 times to a single frame. Each permutation computes 64 DCT coefficients. Overall, Tang's algorithm has time complexity) (MN O , which is linear in terms of number of pixels of a frame. Based on the statistical distribution that a large portion of high-frequency DCT coefficients tend to have zero amplitude, the proposed algorithm can improve the computational efficiency by encrypting only those permutation groups which contains low-frequency DCT coefficients. If we only encrypt a small number of permutation groups, say r, then the running-time complexity of the proposed algorithm.

Can be reduced to O( ) ,where r < k.

VI. CONCLUSIONS

This paper, proposed a computationally efficient, yet secure video encryption scheme. It uses RC5 for encryption of the DCT coefficients and ECC for small key sized generation .The proposed scheme is very fast, possesses good security and adds less overhead on the codec. It slightly decreases the compression rate of the video, which is negotiable for higher security. In fu-ture it would be to reduce the encrypted video size by modifying the default Huffman tables and hence come up with an ideal video encryption algorithm which takes less encryption time and causes no overhead on video size. It can also be extended to videos like MPEG-4, H.261, and H.264 etc

REFERENCES

[1] I. Agi, L. Gong. "An empirical study of secure MPEG video transmission", In Proceedings of the Internet Society Sumposium on Network and Distributed System Security,

[2] L. Tang, "Methods for encrypting and decrypting MPEG video data efficiency", in Proc. Fourth ACM Int. Multimedia Conference. (ACM Multimedia'96), 1996, pp.201-206S..

[3] W. Zeng, S. Lei, "Efficient Frequency Domain Selective Scrambling of Digital Video", IEEE Transaction on Multimedia, Vol. 5, No.1. March

[4] C. Wu, C, Kuo, "Efficient multimedia encryption via scrambling by spatially shuffling codewords of compressed bitstreams", in Proc. SPIE Security and watermarking of Multimedia Contents III, vol. 4314, San Jose, CA, Jan.

[5] J, Wen, M. Severa, W. Zeng, M. Luttrell and W. Jin, "A format compliant configurable encryption framework for access control of multimedia", in IEEE Workshop on Multimedia Signal Processing, pp. 435-440, Oct. 2001.*FLEXChip Signal Processor (MC68175/D)*, Motorola, 1996.

[6] J, Wen, M. Severa, W. Zeng, M. Luttrell and W. Jin, "A format compliant configurable encryption framework for access control of video", IEEE Transaction. CSVT, Special Issue on Wireless Video, 2002.

[7] 7. A. S. Tosun and W. Feng, "A light-weight mechanism for securing multi-layer video streams", Proc. IEEE International Conference on Information Technology:

[8] C. Yuan, B. B. Zhu, Y. Wang, S. Li and Y. Zhong, "Efficient and fully scalable encryption for MPEG-4 FGS", in Proc. IEEE Int. Symp. Circuits and Systems, vol.2, Bangkok, Thailand, May 2003, pp 620-623.

[9] 9. B. Zhu, C. Yuan, Y. Wang, S. Li, "Scalable protection for MPEG-4 fine granularity scalability", IEEE Transactions on Multimedia, vol.7, No.2, April 2005. 10. st

[10] L. Qiao and K. Nahrstedt, "A new algorithm for MPEG video encryption", in Proc. 1 Int. Conf. Imaging Science, Systems & Tech, Las Vegas, Jun, 1997, pp 21-29. 11. C. Shi and B.Bhargava, "A fast MPEG video encryption algorithms", Int. J. Comput. & Graph., vol.22, No.3, 1998.

[11] Mr.Avinash P. Wadhe,Mrs Lekha Bhandari "Speeding up Video Encryption using Elliptic Curve Cryptography (ECC)" International Journal of Emerging Research in Management &Technology ISSN: 2278-9359 (Volume-2, Issue-3)

Area and Speed wise superior Vedic multiplier for FPGA based arithmetic circuits

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ABSTRACT

The speed of a multiplier is very important to any Digital Signal Processor (DSPs). Vedic Mathematics is the earliest method of Indian mathematics which has a unique technique of calculations based on 16 Formulae. This paper presents the efficiency of Urdhva Triyagbhyam Vedic method for multiplication, which strikes a difference in the actual process of multiplication itself. We are proposing the high speed and low combinational delay multiplier i.e. the fundamental block of MAC based on ancient Vedic mathematics. It enables parallel generation of partial products and eliminates unwanted multiplication steps. Multiplier architecture is based on generating all partial products and their sums in one step. Chipscope VIO is used to give random inputs of desired values by user, on which proposed Vedic multiplication is performed. The proposed algorithm is modeled using VHDL i.e. Very High Speed integrated circuit hardware description language. The propagation time of the proposed architecture is found quiet less. The Xilinx Chipscope VIO generator allows us to give the runtime inputs. The Xilinx Chipscope tool will be used to test the FPGA inside results while the logic running on FPGA. The Xilinx Spartan 3 Family FPGA development board will be used for this circuit. The proposed multiplier implemented using Vedic multiplication is efficient and competent in terms of area and speed compared to its implementation using Array and Booth multiplier architectures. The results clearly indicate that Urdhava Tiryakbhyam can have a great impact on improving the speed of Digital Signal Processors.

Keywords- *Vedic Multiplier, urdhva tiryakbhayam, High Speed, Low Power, Latency.*

I. INTRODUCTION

The requirement for high speed processing has been increased because of newer computer applications and to achieve the desired performance in many real time signal and image processing applications, higher throughput arithmetic operations are important. Instead of having more consuming processing time system, we have proposed Urdhva Triyagbhyam Vedic method for arithmetic operations which perform a large no of mathematical calculations in a very less time. It increases the overall speed of the different electronics devices.

Digital multipliers are the center components of all the digital signal processors (DSPs) and the speed of the DSP is mostly determined by the speed of its multipliers. They are essential in the implementation of computation systems like Fast Fourier transforms (FFTs) and multiply accumulate (MAC). Array multiplication algorithm and Booth multiplication algorithm are most commonly multiplication algorithms implemented in the digital hardware. The computation time in array multiplier is comparatively less because it calculate execution of partial products independently by using parallelism. The delay associated with the array multiplier is the time taken by the signals to propagate through the gates that form the multiplication array. Since it consume low-power and have comparatively good performance.

Booth Multiplier is another standard approaches and multiplication algorithm to have hardware implementation of binary multiplier for VLSI implementation at low power. Large booth arrays are required for high speed multiplication and exponential operations which need huge partial sum and partial carry registers. It requires around $n = (2m)$ clock cycles to create the least significant half of the final product for multiplication of two n-bit operands using a radix-4 booth recording multiplier, where m is the number of Booth recorder adder stages. Hence, a large propagation delay is associated with Booth Multiplier. Due to the importance of digital multipliers in DSP, it has always been an active area of research and a number of interesting multiplication algorithms have been reported in the literature. In this paper, we have proposed one such new multiplication algorithm which avoids the need of large multipliers by reducing the large number to the smaller number

multiplication's count which reduces the propagation delay linked with the conventional large multipliers significantly.

The structure of the proposed algorithm is based on the Nikhilam Sutra (formula) of Vedic mathematics which is simply means: "all from 9 and the last from 10". The algorithm has its best case in multiplication of numbers, which are nearer to bases of 10, 100, 1000 i.e. increased powers of 10. The procedure of multiplication using the Nikhilam involves minimum calculations, which in turn will lead to reduced number of steps in computation, reducing the space, saving more time for computation. Hence it optimizes to take full advantage of reduction in the number of bits in multiplication. Although Nikhilam Sutra is applicable to all cases of multiplication, it is more efficient when the numbers involved are large.

II. RELATED WORKS

There have been several efforts for Urdhva Triyagbhyam Vedic method for multiplication. Ramesh Pushpangadan, Vineet Sukumaran has proposed methodology by using Urdhva Triyagbhyam Vedic method which having main advantages is delay increases slowly as input bit increases.

V Jayaprakasan, S Vijayakumar, V S Kanchana Bhaaskaran [8] has proposed methodology of A 4x4 multiplier based on the Vedic and Conventional methods have been designed using SPICE simulator. Simulation results depict the Vedic design incurring 29% of reduced average power.

Sandesh S. Saokar, R. M. Banakar, Saroja Siddamal [6] proposed a fast multiplier architecture for signed Q-format multiplications using Urdhava Tiryakbhyam method of Vedic mathematics. Since Q-format representation is widely used in Digital Signal Processors the proposed multiplier can substantially speed up the multiplication operation which is the basic hardware block. They occupy less area and are faster than the booth multipliers. But it has not introduced pipeline stages in the multiplier architecture for maximizing throughput.

We have gone through different existing research on multiplier for less power consumption and time efficiency. But many lacunas present in this methodology. Here we have proposed our methodology which consume less power, less area as well as less time since it optimize the overall performance of the system.

III. WALLACE TREE MULTIPLIER

In 1964, Australian Computer Scientist Chris Wallace has developed Wallace tree which is an efficient hardware implementation of a digital circuit that multiplies two integers. A fast process for multiplication of two numbers was developed by Wallace [5].

Using this method, a three step process is used to multiply two numbers; the bit products are formed, the bit product matrix is reduced to a two row matrix where sum of the row equals the sum of bit products, and the two resulting rows are summed with a fast adder to produce a final product.

Three bit signals are passed to a one bit full adder ("3W") which is called a three input Wallace tree circuit and the output of sum signal is supplied to the next stage full adder of the same bit. The carry output signal is passed to the next stage full adder of the same no of bit, and the carry output signal thereof is supplied to the next stage of the full adder located at a one bit higher position.

Wallace tree is a tree of **carry-save adders** (CSA) arranged as shown in **figure 1**. A carry save adder consists of full adders like the more familiar ripple adders, but the carry output from each bit is brought out to form second result vector rather being than wired to the next most significant bit. The carry vector is 'saved' to be combined with the sum later.

In the Wallace tree method, the circuit layout is not easy although the speed of the operation is high since the circuit is quite irregular.

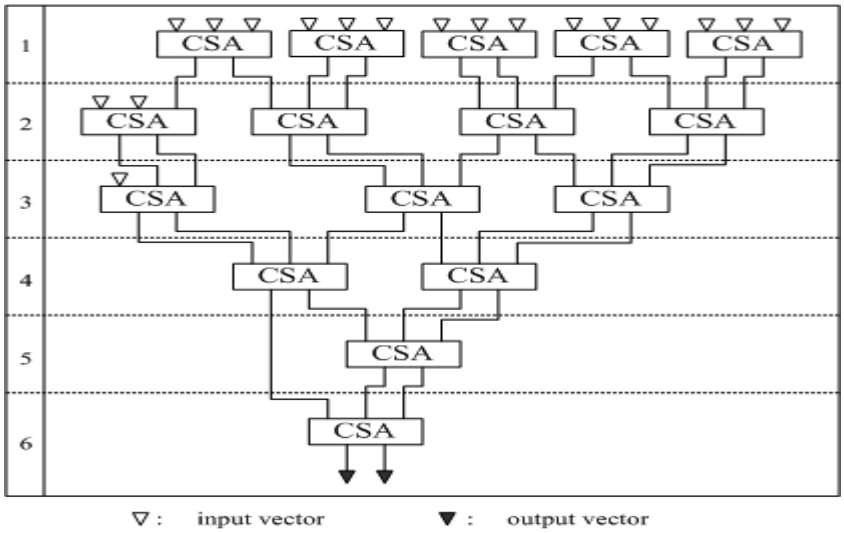

Figure 1: Wallace tree of carry-save adders

Wallace tree is known for their optimal computation time, when adding multiple operands to two outputs using carry-save adders. The Wallace tree guarantees the lowest overall delay but requires the largest number of wiring tracks (vertical feed through between adjacent bit-slices). The number of wiring tracks is a measure of wiring complexity. Figure 1 show an 18-operand Wallace tree, where CSA indicates a carry-save adder having three multi-bit inputs and two multi-bit outputs.

IV. BOOTH MULTIPLIER

Another improvement in the multiplier is by reducing the number of partial products generated. Booth's multiplication algorithm is a multiplication algorithm that multiplies two signed binary numbers in two's complement notation. The algorithm was invented by Andrew Donald Booth in 1950[4].

The Booth recording multiplier is such multiplier which scans the three bits at a time to reduce the number of partial products. These three bits are: the two bit from the present pair; and a third bit from the high order bit of an adjacent lower order pair. After examining each triplet of bits, the triplets are converted by Booth logic into a set of five control signals used by the adder cells in the array to control the operations performed by the adder cells.

To speed up the multiplication Booth encoding performs several steps of multiplication at once. Booth's algorithm takes advantage of the fact that an adder, sub tractor is nearly as fast and small as a simple adder. If 3 consecutive bits are same then addition/subtraction operation can be skipped.

Thus in most of the cases the delay associated with Booth Multiplication are smaller than that with Array Multiplier. However the performance of Booth Multiplier for delay is input data dependant. In the worst case the delay with booth multiplier is on par with Array Multiplier. The method of Booth recording reduces the numbers of adders and hence the delay required to produce the partial sums by examining three bits at a time.

The high performance of booth multiplier comes with the drawback of power consumption. The reason is large number of adder cells required that consumes large power.

V. VEDIC MATHEMATICS

Vedic Mathematics hails from the ancient Indian scriptures called "*Vedas"* or the source of knowledge. This system of computation covers all forms of mathematics, be it geometry, trigonometry or algebra. The prominent feature of Vedic Mathematics is the rationality in its algorithms which are designed to work naturally. This makes it the easiest and fastest way to perform any mathematical calculation mentally.

Vedic Mathematics is believed to be created around 1500 BC and was rediscovered between 1911 to 1918 by Sri Bharti Krishna Tirthaji (1884-1960) who was a Sanskrit scholar, mathematician and a philosopher [1].

He organized and classified the whole of Vedic Mathematics into 16 formulae or also called as *sutras.* These formulae form the backbone of Vedic mathematics. Great amount of research has been done all these years to implement algorithms of Vedic mathematics on digital processors.

It has been observed that due to coherence and symmetry in these algorithms it can have a regular silicon layout and consume less area along with lower power consumption.

VI. URDHAVA TIRYAKBHYAM METHOD

Urdhava Tiryakbhyam [2] is a Sanskrit word which means vertically and crosswire in English. The method is a general multiplication formula applicable to all cases of multiplication. It is based on a novel concept through which all partial products are generated concurrently.

Fig. 2 demonstrates a 4 x 4 binary multiplication using this method. The method can be generalized for any N x N bit multiplication. This type of multiplier is independent of the clock frequency of the processor because the partial products and their sums are calculated in parallel. The net advantage is that it reduces the need of microprocessors to operate at increasingly higher clock frequencies. As the operating frequency of a processor increases the number of switching instances also increases. This results in more power consumption and also dissipation in the form of heat which results in higher device operating temperatures.

Another advantage of Urdhva Tiryakbhyam multiplier is its scalability. The processing power can easily be increased by increasing the input and output data bus widths since it has a regular structure. Due to its regular structure, it can be easily layout in a silicon chip and also consumes optimum area. As the number of input bits increase, gate delay and area increase very slowly as compared to other multipliers. Therefore Urdhava Tiryakbhyam multiplier is time, space and power efficient. The line diagram in fig. 2 illustrates the algorithm for multiplying two 4-bit binary numbers a3a2a1a0 and b3b2b1b0. The procedure is divided into 7 steps and each step generates partial products.

Initially as shown in step 1 of fig. 2, the least significant bit (LSB) of the multiplier is multiplied with least significant bit of the multiplicand (vertical multiplication). This result forms the LSB of the product. In step 2 next higher bit of the multiplier is multiplied with the LSB of the multiplicand and the LSB of the multiplier is multiplied with the next higher bit of the multiplicand (crosswire multiplication). These two partial products are added and the LSB of the sum is the next higher bit of the final product and the remaining bits are carried to the next step.

For example, if in some intermediate step, we get the result as 1101, then 1 will act as the result bit(referred as rn) and 110 as the carry (referred as cn). Therefore cn may be a multi-bit number. Similarly other steps are carried out as indicated by the line diagram. The important feature is that all the partial products and their sums for every step can be calculated in parallel.

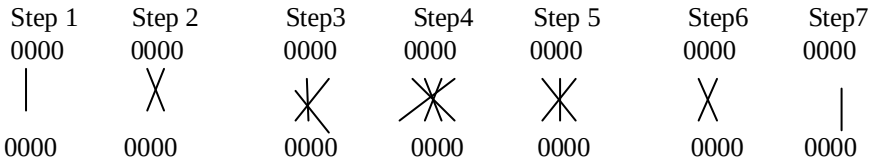

Fig. 2 Multiplication of two 4 bit numbers using Urdhava Tiryakbhyam method

VII. FPGA ARCHITECTURE:

Field-Programmable Gate Arrays (FPGAs) have become one of the key digital circuit implementation media over the last decade. A crucial part of their creation lies in their architecture, which governs the nature of their programmable logic functionality and their programmable inter-connect. FPGA architecture has a dramatic effect on the quality of the final device's speed performance, area efficiency, and power consumption. Field-Programmable Gate Arrays (FPGAs) are pre-fabricated silicon devices that can be electrically programmed to become almost any kind of digital circuit or system.

FPGAs, as illustrated in Figure 3, consist of an array of programmable logic blocks of potentially different types, including general logic, memory and multiplier blocks, surrounded by a programmable routing fabric that allows blocks to be programmable interconnected.

The array is surrounded by programmable input/output blocks, labeled
I/O in the figure that connect the chip to the outside world. The "programmable" term in FPGA indicates an ability to program a function into the chip after silicon fabrication is complete. This customization is made possible by the programming technology, which is a method that can cause a change in the behavior of the pre-fabricated chip after fabrication, in the "field," where system users create designs,

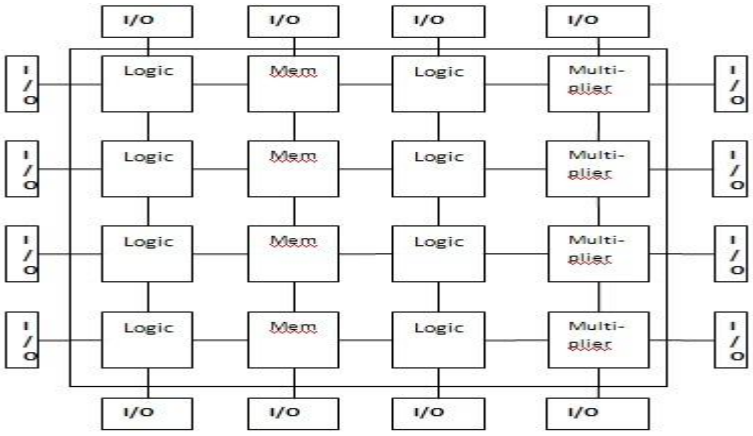

Fig.3: Basic FPGA structure.

VIII. CHIP SCOPE RESULTS

Here two 8- bit numbers are given to our vedic multiplier. The intermediate results from the 8-bit ripple carry adders, 4X4 vedic multiplier are used and we can observe the outputs of Vedic multiplier for variable length inputs by using Chipscope-VIO. These results for various inputs are verified using normal calculator. Data inputs given to vedic multiplier using Chipscope-VIO are as follows;

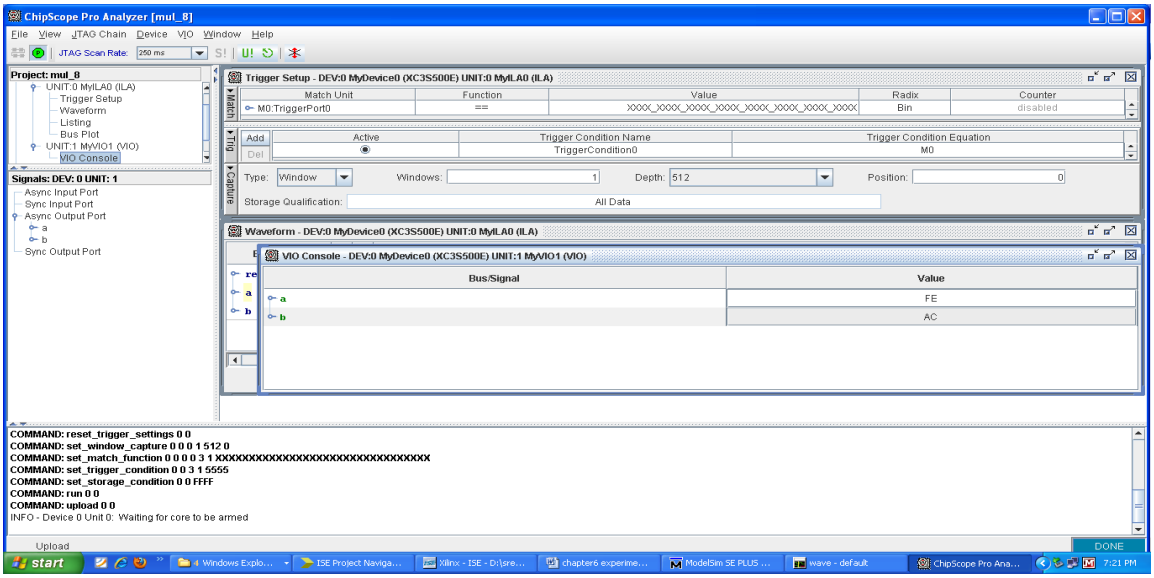

Figure 5.3: Data inputs given to vedic multiplier using Chipscope-VIO

- Here we are giving the variable length inputs in runtime using Chipscope-VIO
- We can give desired inputs to Vedic multiplier at runtime are shown above.

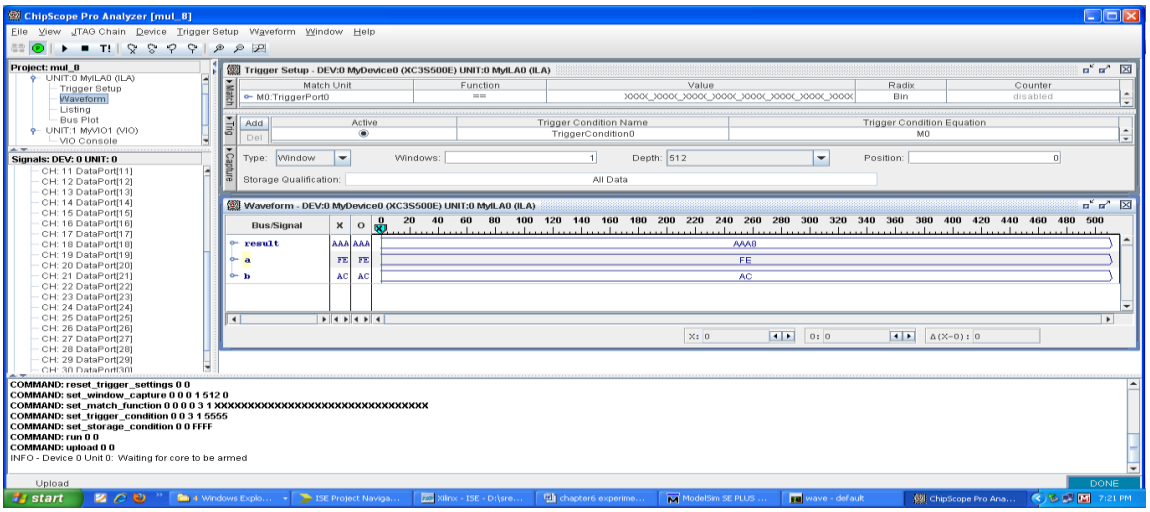

Figure 6.2: Data output of vedic multiplier with inputs.

The corresponding results for various inputs we can obtain in Chipscope analyser are shown above. The results obtained for various test patterns are verified using normal calculator.

IX. CONCLUSION

It can be concluded that Vedic multiplier and square is faster than array multiplier and Booth multiplier. The arrangement of adders at architectural level is the main focus of this work. The difference of the adder count is the importance source which reduces the average power of the Vedic multiplier. Due to factors of timing efficiency, speed and lesser area, the proposed Vedic multiplier and square can be implemented in Arithmetic and Logical Units replacing the traditional multipliers and squares based on array and Booth multiplication.

In summary, embodiments of the invention provide a design for a flexible multiplier and square which can be considerably faster than existing multipliers and squares reported previously in the literature. The speed improvements are gained by parallelizing the generation of partial products with their concurrent summations. It is demonstrated that this design is quite efficient in terms of silicon area/speed. Such a design should enable substantial savings of resources in the FPGA when used for image/video processing applications. The Urdhava Tiryakbhyam Q-format multiplier is best suited for signal processing applications requiring faster multiplications.

REFERENCE

[1] Jagadguru Swami Sri Bharati Krisna Tirthaji Maharaja, "*Vedic Mathematics: Sixteen Simple Mathematical Formulae from the Veda*," Motilal Banarasidas Publishers, Delhi, 2009, pp. 5-45.

[2] H. Thapliyal and M. B. Shrinivas and H. Arbania, "*Design and Analysis of a VLSI Based High Performance Low Power Parallel Square Architecture*," Int. Conf. Algo.Math.Comp. Sc., Las Vegas, June 2005, pp. 72-76.

[3] 'Xilinx ISE User manual', Xilinx Inc, USA, 2007

[4] A. D. Booth, "A signed binary multiplication technique," Q. J. Mech.Appl. Math., vol. 4, pp. 236–240, 1951.

[5] C. S. Wallace, "A suggestion for a fast multiplier," lEEE Trans.Electronic Comput., vol. EC-\3, pp. 14-17, Dec. 1964.

[6] Sandesh S. Saokar, R. M. Banakar, Saroja Siddamal, "High Speed Signed Multiplier for Digital Signal Processing Applications" 2012 IEEE.

[7] A.Raman, A.Kumar and R.K.Sarin, "High Speed Reconfigurable FFT Design by Vedic Mathematics", Journal of Computer Science and Engineering, Vol. 1, Issue 1, pp 59-63, May,2010.

[8] V Jayaprakasan, S Vijayakumar, V S Kanchana Bhaaskaran, "Evaluation of the Conventional vs. Ancient Computation methodology for Energy Efficient Arithmetic Architecture".

[9] R. Pushpangadan, V. Sukumaran, R.Innocent, D.Sasikumar, and V.Sunder, "High Speed Vedic Multiplier for Digital Signal Processors", IETE Journal of Research, vol.55, pp.282-286, 2009.

Effect of nano-silica on properties of blended cement

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ABSTRACT:
The properties of blended cement with nano-SiO_2 (NS) were experimentally studied. The silica, which is the major component of a pozzolan reacts with calcium hydroxide formed from calcium silicates hydration. The rate of pozzolanic reaction is proportional to the amount of surface area available for reaction. Results indicated that setting times were increased with increase in percentage of nano-SiO_2 in cement blended with silica fume. A combination of 6% SF + 3%NS was given the best performance in compressive strength. XRD was used to analyze the results.

Keywords*: Nano-Silica, Silica fume, Compressive strength, setting time.*

I. INTRODUCTION:

Recently, nano technology has created noticeable scientific interest due to the new prospective uses of particles in nanometer (10^{-9} m) scale. The nano particles can result in radically improved properties from conventional grain size materials of the similar chemical composition. Nano particles are using to design new novel products that function at unique levels. There are few reports on mixing nano particles in cement mortars with materials. Hui Li (1) investigated cement mortars with nano-silica or nano-ferric oxide to explore their super potentials. Ye Qing et al (2) studied influence of nano-silica on properties of hardened cement paste as compared with silica fume. Byung-Wan Jo et al(3) studied characteristics of cement mortar with nano-silica particles Lu and Young (4) produced 800 MPa of compressive strength samples, and Richard and Cheyrezy (5) developed Reactive power Concrete ranging from 200 to 800 MPa. Gengying Li (6) laboratory study carried out on properties of high volume fly ash concrete incorporating nano-SiO_2. With these advantages, the aim of this study is to investigate the influence of nano-SiO_2 on properties of blended cement mortar.

II. MATERIALS AND METHODS

2.1 Material:

Cement: 53-grade ordinary Portland cement conforming to IS: 12269-1987 was used. The physical properties and chemical composition of major compounds of cement are given in Table 1 and 2 respectively.

Table.1 Physical properties of cement

SL No	Property	Result
1	Specific gravity	3.17
2	Fineness	225 m^2/kg
3	Initial setting time	114 minutes
4	Final setting time	224 minutes
5	Compressive strength	MPa
a)	3 days	33
b)	7days	43
c)	28 days	54
6	soundness	0.5 mm

Table. 2 Chemical composition of cement

Sl No	Oxide composition	percent
1	CaO	64.59
2	SiO_2	23.95.
3	Al_2O_3	6.89
4	Fe_2O_3	3.85
5	MgO	0.78
6	SO_3	1.06
7	K_2O	0.46
8	N_2O	0.12
9	Loss on ignition	1.2
10	Insoluble residue	0.35

Sand: Ennore sand conforming to IS: 650-1966 was used. Physical properties are given in Table.3. The cement to fine aggregate ratio was maintained at 1:3(by weight) in the mortar mixes.

Table. 3 Physical properties of sand

Sl No	Property	Result
1	Specific gravity	2.65
2	Bulk density	15.84 kN/m^3
3	Grading	percent
4	Passing 2mm sieve	100%
5	Passing 90µ sieve	100%
6	Particle passing 2mm and retained 1mm	33.33%
7	Particle passing 1mm and retained 500µ	33.33%
8	Particle passing 500µ and retained 90µ	33.33%

Superplasticiser: Commercial superplasticiser was used. Based on a number of trials, 0.8% (by weight of cement) was arrived.

Silica Fume: Silica fume was used in the present investigation. 9% of the cement was replaced by silica fume, where maximum compressive strength was achieved. The chemical composition is given in Table. 4.

Table. 4 Chemical composition of silica fume

Sl No	Oxide composition	Percent
1	CaO	0.5
2	SiO_2	92.3
3	Al_2O_3	2.7
4	Fe_2O_3	1.4
5	MgO	0.3
6	SO_3	0.1
7	K_2O	0.1
8	N_2O	0.1
9	Loss on ignition	1.8

Nano-Silica: Nano-SiO_2 (NS) was used in the present experimental study. Properties provided by manufacturer are given in Table. 5

Table.5 properties of nano-silica

Sl No	Property	Result
	Particle size	15nm
1	SiO_2	➢ 99%
2	Density	50kg/m^3
3	Specific Surface area	200 m^2/g

III. METHODS:

The opted percentages of Nano-SiO_2 (NS) were 1, 2, 3, and 4% for this experimental study. The percentages were arrived based on the literature. After number of combinations tried, a combination (91%OPC + 9% SF + 0.8% SP) was fixed for reference specimens where maximum compressive strength was attained. The physical properties of reference specimens are given in Table. 5.

Table: 5 Physical properties of reference cement mortar

Sl No	Property	Result
1	Initial setting time	160 minutes
2	Final setting time	272 minutes
3	Compressive strength	MPa
a)	3 days	49
b)	7 days	59
c)	28 days	67
d)	60 days	75
4	Soundness	0.7 mm

Details of mix proportions for test mortars containing silica fume and nan-SiO_2 are given in Table 6. Four series of specimens were cast for test. The test specimens were cast with (91% OPC + 9% SF + 0.8% SP + NS). Silica fume was replaced with 1, 2, 3 and 4% of Nano-SiO_2(NS) particles for test specimens. The quantities of cement, Ennore sand and mixing waters for each specimen were 200g, 600g and (P/4) + 3 where P denotes the percentage of mixing water required to produce a paste of standard consistence for reference . The obtained water cement ratio for reference was constant for four series of test samples. In four series of test samples, the amount of superplasticizer was arrived in test samples for a constant water to cement ratio of (28%). Initial and final setting times were found out by Vicat's apparatus. Le-Chatelier equipment was used to find soundness of reference and test specimens. The reference and test specimens were prepared using standard metallic cube mould of size 7.06 X 7.06 X 7.06cm for compressive strength of mortar. The blended cement to sand ratio was 1: 3 by weight throughout the tests. The compressive strength of reference and test specimens was studied at different ages, at 3, 7, 28, and 60 days. The compacted specimens in mould were maintained at a controlled temperature of 27 ± 2^0 and 90 percent relative humidity for 24 hours by keeping the moulds under gunny bags wetted by the deioned water and then demolded. After demolding, the specimens were cured in deionised water for 27 days. From the experiments of setting and soundness tests, an average of three values was used to compare the results of the reference specimens. In the case of compressive strength tests, three test specimens were compared with three reference specimens.

Table: 6 Mix proportions of Reference(R) and test (T) samples.

Sample	Mix proportion in percentage				
	cement	SF	NS	W/C ration	SP
R	91	9	0	0.28	0.8
T-1	91	8	1	0.28	1.2
T-2	91	7	2	0.28	1.8
T-3	91	6	3	0.28	2.3
T-4	91	5	4	0.28	2.7

IV. TEST PROCEDURE:

The cement mortars were mixed in a rotary mixer. Nano particles are not dispersing uniformly due to their high surface energy. Accordingly, mixing was performed as follows.

The nano- SiO_2 particles were stirred with the mixing water at high speed (120rpm) for 1minute. The cement and silica fume were added to the mixer and mixed at medium speed (80rpm) for another 30s. Mixing at medium speed, the sand was added gradually. The superplasticizer was added and stirred at high speed for additional 30 s. The mixture was allowed to rest for 90s and then mixed for 1 min at high speed.

V. POWDERED X – RAY DIFFRACTION STUDIES:

Powder X – ray diffraction (XRD) is one of the commonly used techniques for investigation of crystalline compounds in hydrated cement paste (Knudsen, 1976). The reference sample (R) and test sample (T-3) for XRD were ground to a fine powder and a flat specimen was prepared on a glass surface using an adhesive. The diffracted intensities were recorded with powdered diffractometer using monochromatic copper Kα radiation.

VI. RESULT AND DISCUSSION:

6.1 Soundness:

Soundness of reference (R) and test samples (T-1 to T-4) are shown in Fig1. It can be seen that soundness of reference and test samples was same i.e., 0.7 mm. Hence, all samples were considered to be sound.

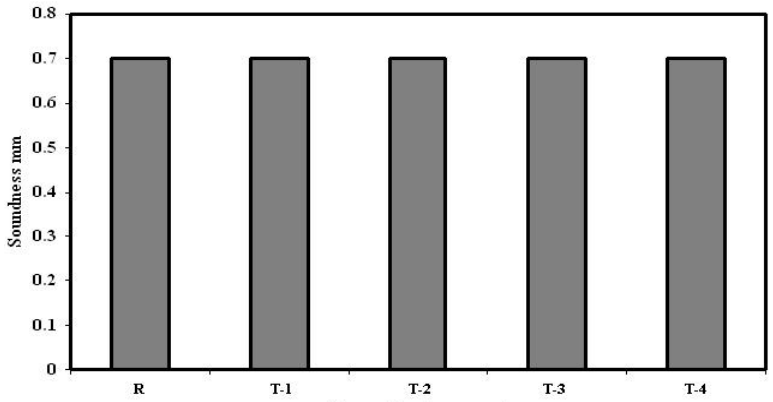

Fig. 1 Influence of nano-silica on soundness of blended cement

6.2 Setting time:

Setting times of reference (R) and test samples (T-1 to T-4) are depicted in Fig 2. It reveals that setting times were increased in test samples compared with reference sample. Increase in initial setting time was 13, 29, 44 and 61 minutes and final setting time was 8, 10, 19 and 28 minutes for T-1, T-2, T-3 and T-4 of test samples compared with that of reference (R) sample. Setting process was increased due increase in percentage of nano-silica. Reason is that, surface area of nano-silica is several times high than the silica fume.

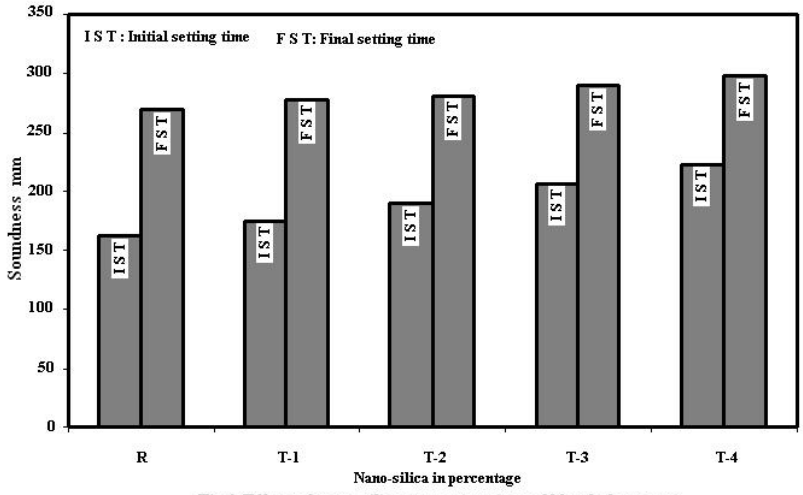

Fig 2 Effect of nano-silica on setting time of blended cement

6.3 Compressive strength:

Influence of nano-silica on compressive strength is shown in Fig 3. It is found that increase in compressive strength was observed with increase in percentage of nano-silica replacing silica fume and age. At early age (3 and 7 days), increase in gain of compressive strength was significant in all test samples compared with reference sample. However, increase in compressive strength was noticed of T-1 to T-3 but decrease in compressive strength had initiated in T-4. As compared with reference, the maximum strength registered in T-3 sample. The strength of test sample T-3 increased by 34.7, 25.4, 19.4 and 17.3% at ages of 3, 7, 28 and 60 days respectively.

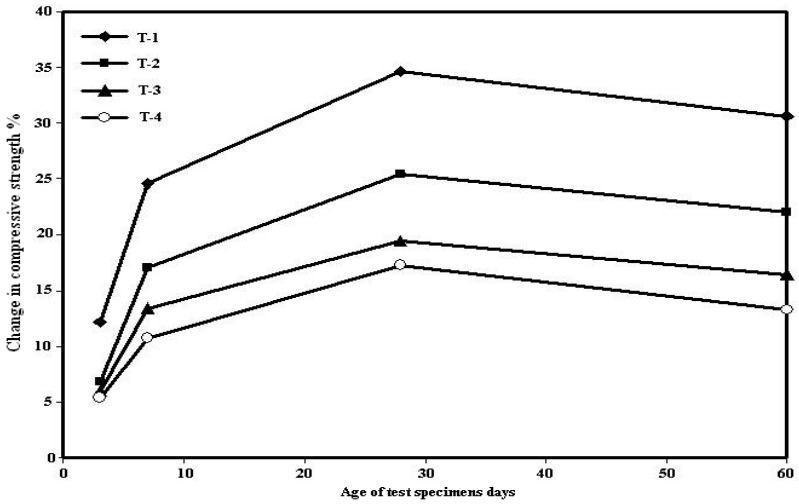

Fig 3 Influence of nano-silica on compressive strength of blended cement

6.4 Comparison of XRD patterns between OPC, Reference and Test samples:

Fig. 4 shows that powder X – ray diffraction patterns of OPC, reference and test samples. OPC, reference and test sample were cured for 28 days before being subjected to XRD technique. After employing XRD for above three samples, calcium hydroxide (CH) was found out, at 17.9^0, 47.1^0 and C_3S was found out at 28.8^0, 32.4^0, 33.7^0. These observation demonstrated that rate of reaction of silica from nano-silica was faster than the silica fume with CH, hence, extra quantity of C-S-H was produced, their by extra strength was contributed to test specimens. Apart that, nano-silica acted as filler material in pore of cement paste matrix, so that voids were minimised, this also contributed extra strength.

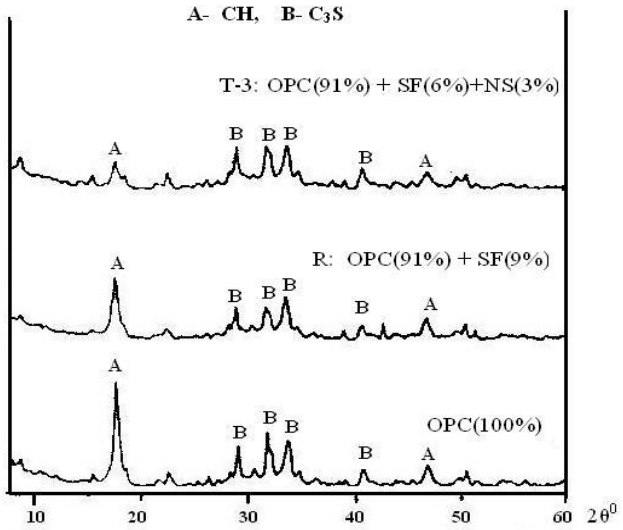

Fig 4 Comparison of XRD patterns between OPC, reference and test samples at age of 28 days

REFERENCES:

1) Li Hui, Xiao Hui-gang, Yuan Jie, Ou Jinping, "Microstructure of cement mortar with nano-particles", Composites part B: Engineering 35 (March) 2003.

2) Ye Qing, Zhang Zenan, Kong Deyu, Chen Rongshen, " Influence of nano-SiO_2 addition on properties of hardened cement paste as compared with silica fume," Construction and Building materials, 21, 539-545 2007.

3) Byung-Wan Jo, Chang-Hyun Kim, Ghi-ho Tae, Jong-Bin Park, " Characteristics of cement mortar with nano-SiO_2 particles," Construction and Building materials, 21, 1351-1355, 2007.
4) Lu P, Young JF, "Hot pressed DSP cement paste", Material Research Society Symposium Proceedings, 245,1992.
5) Richard P, Cheyrezy M. reactive powder concretes with high ductility and 200-800 MPa compressive strength, San Francisco: ACI Spring convention, SP 144-124, 1994.
6) Gengying Li,"Properties of high-volume fly ash concrete incorporating nan-SiO_2", Cement Concrete Research 34, 1043-1049,2004.

Load Forecasting For Practical Power Systems by Using Artificial Neural Networks and Classical Techniques – A Case Study

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ABSTRACT:
This paper presents a method of STLF (Short Term Load Forecasting) in electrical power system using ANN. In this a multilayered feed forward network with back propagation learning algorithm is used because of its god generalizing property. The input to the Neural network is in terms of past load data which are heuristically chosen such that they reflect the trend, load shape as well as some influence of weather, but here the weather data is not used to train the network. The network is trained to predict one hour ahead load forecasting in both ANN as well as Conventional (Regression) methods. This method is trained for one month load forecasting data and two months load forecasting data and found that the MAPE(Mean absolute percentage error) obtained is small especially for prediction of load for hourly in considering two months data than one month data to train the network.

Keywords: *STLF, ANN, Load Forecasting, Load demand*

I. INTRODUCTION

Forecasting of load is what will happen in the future by simulating the loads for certain conditions or trends with the help of available past data. Over the years forecasting has been refined considerably and has now reached a stage where it is more precise and unbiased. In Electrical Power Systems, there is a great need for accurately forecasting the load and energy requirements because electricity generation and distribution are a great financial liability to the State Corporation. Accurate Forecasting is also necessary because availability of electricity is one of the several important factors for agricultural and industrial development. If the Energy Forecast is too conservative, then there will be a chance of generating capacity falling short of the actual demand, resulting in the restrictions being imposed on the power supply, which will affect the economic aspects of well being of the corporation of the state. If the Forecast is too optimistic, it may lead to excess generating capacity resulting in part of the investment not giving immediate returns.

A developing country like India the financial resources are minimum, it cannot afford to face the two situations mentioned above. So it must be appropriate to consider Electrical Load Forecasting importance. In order to do proper estimation of load and analyzing its pattern, to receive adequate rate of return of the investment for maximum utilization of the plant, it is important to consider both i) magnitude of the system load and ii) location of these loads. Several electric power companies have adapted the conventional methods for forecasting the future load. In conventional methods, the models are designed based on the relationship between load power and factors influencing load power. The conventional method has the advantage that we can forecast load power with a simple prediction model. However, since the relationship between load power and factors influencing load power is nonlinear, it is difficult to identify its non-linearity by using conventional methods. It is observed that perfect prediction is hardly ever been possible.

The thought of using the Artificial Neural Networks gives reasonably good predictions while estimation of loads and model can be utilized effectively when compared with the statistical techniques. It is mainly due to the ability of ANN in supporting a non-linear mapping between input and output variables along with its special features such as robust performance in the noisy and incomplete data environments, high parallel computation and self-learning. General software for Forecasting the load for different scenarios is developed and variables are trained using the MATLAB. STLF is an essential tool in operation and planning of the power system. It helps in coordinating the generation and area interchange to meet the load demand. It also helps in security assessment, dynamic state estimation, load management and other related functions. STLF are primarily

used for economic load dispatch, daily operation and control and assurance of reliable power supply. In the last few decades, various methods for STLF have been proposed which are

Statistical Methods

Statistical methods include multiple linear regression, autoregressive models, stochastic time series, state space methods4, general exponential smoothing, etc. A detailed review of these methods is given in Gross and Galiana and Moghram and Rahman7. These methods though having a sound mathematical understanding are generally based on statistically assumed model and different environmental factors. The accuracy of such methods depends on the accuracy and relevance of this heuristically modeled load.

Artificial Neural Networks

The weights on the interconnections are estimated iteratively by a non-linear optimization method using known sets of input and output data, such adaptation of the network is referred to as the 'Training' or the 'Learning' of the network. The underlying idea is the biological nervous system-like performance of the network in learning complex processes. The main characteristic features are the network architecture, the non-linearity associated with the nodes and the training method used. The designs are not unique, and there may be heuristics associated with the specification of the network structure. The diagram shown below depicts the basic functioning of a neural network Figure 1. The output of the neural network is compared with the target (desired output) and the weights are adjusted so as to minimize the error between the output and the target. This process is repeated till the desired level of accuracy is achieved

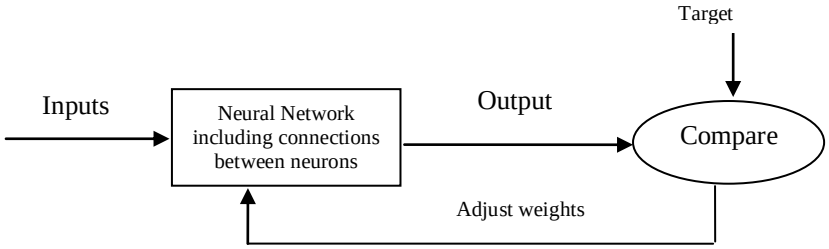

Figure 1 functioning of a neural network

Recently, Artificial Neural Networks (ANN) has been used for STLF. In this paper, a short term load forecasting method using the ANN is proposed. A multilayered feed forward (MLFF) neural network with back propagation learning algorithm has been used because of its simplicity and good generalization property. These methods used various network architectures and supervised as well as unsupervised learning rules. A brief review of performance of popular architectures is given by Parll, et al8. Though standard design procedures differ from author, networks are mostly designed on trail and error and engineering judgments. This is not a major obstacle because these trial and error methods can be easily implemented. Feed forward networks are extensively used for the problem because of easier implementation. A large number of architectures based on feed forward models used for daily Average, daily Peak, and daily hourly load for both one month and two months are reported. The input, to the neural network is based only on past load data and are heuristically chosen in such a manner that they inherently reflect all the major components, such as, trend, type of day, hour of the day and load.

II. MATAMATICAL MODEL:

Regression Models:

Regression models fall under the category of casual models of forecasting. In many models there are two or more variables are related, and it is of interest to model and explore this relationship. In general, suppose that there is a single dependent variable or response variable that depends on one or more independent variables. The relationship between these variables is characterized by a mathematical model called a 'Regression Model'. The following are the various regression model equations that are available in the literature.

Simple linear regression:

$$Y_t = a + bX \text{……..(1)}$$

Multiple linear regressions:

$$Y_t = a + bX^1 + cX^2 + \text{……..(2)}$$

Curvy linear regression:

$$Y_t = a + bX + cX^2 + dX^3 + \text{……..(3)}$$

In the present work simple linear regression models are developed for daily average load forecasting and multiple linear regression models are developed for hourly load forecasting.

III. ESTIMATION OF PARAMETERS IN LINEAR REGRESSION MODELS SIMPLE REGRESSION:

Where X is independent variable and Y is dependent variable. Where "a" indicates intercept $a = \bar{y} - b\bar{x}$ .Where "b" indicates $b = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2}$ $where \bar{x} = \frac{\sum x}{n}$ $and \bar{y} = \frac{\sum y}{n}$ = slope……..(4)

Multiple Linear Regressions

The method of least squares is typically used to estimate the regression coefficients in a multiple linear regression model. Suppose that n>k observations on the response variable are available say, y_1, y_2… y_n. Along with each observed response y_i, we will have an observation on each regressed variable and let x_{ij} denote the ith level of variable x_j. We assume that the error term € in the model has E(€) =0 and V(€) = σ^2 and that the {€ i} are uncorrelated random variables. We may write the model equation

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik} + €_I \text{……..(5)}$$

$$y_i = \beta_o + \sum_{j=1}^{k} \beta_j x_{ij} + \in_i \text{ ……..(6)}$$

i = 1, 2… n

The method of least squares chooses the β's in equation (6) so that the sum of the squares of errors, $€_I$, is minimized. The least squares function is

$$L = \sum_{i=1}^{n} \in_i^2 = \sum_{i=1}^{n} (y_i - \beta_o - \sum_{j=1}^{k} \beta_j x_{ij})^2 \text{ ……..(7)}$$

The function L is to be minimized with respect to β_0, β_1… β_k. The least square estimators, say β_0, β_1… β_k, must satisfy

$$\frac{\partial L}{\partial \beta} = -2\sum_{i=1}^{n} (yi - \hat{\beta}0 - \sum_{j=1}^{k} \hat{\beta}jxij) = 0 \text{ ……..(8)}$$

$$\frac{\partial L}{\partial \beta} = -2\sum_{i=1}^{n} (yi - \hat{\beta}0 - \sum_{j=1}^{k} \hat{\beta}jxij)xij = 0 \text{ ……..(9)}$$

j = 1, 2, ------, k.

Simplifying equation (9), we obtain

$$n\hat{\beta}_0 + \hat{\beta}_1 \sum_{i=1}^{n} x_{i1} + \hat{\beta}_2 \sum_{i=1}^{n} x_{i2} + \ldots.. + \hat{\beta}_k \sum_{i=1}^{n} x_{ik} = \sum_{i=1}^{n} y_i \text{ ……..(10)}$$

$$\hat{\beta}_0 \sum_{i=1}^{n} x_{i1} + \hat{\beta}_1 \sum_{i=1}^{n} x_{i1}^2 + \hat{\beta}_2 \sum_{i=1}^{n} x_{i1}x_{i2} + \ldots.. + \hat{\beta}_k \sum_{i=1}^{n} x_{i1}x_{ik} = \sum_{i=1}^{n} x_{ik}y_i \text{ ……..(11)}$$

$$\hat{\beta}_0 \sum_{i=1}^{n} x_{ik} + \hat{\beta}_1 \sum_{i=1}^{n} x_{ik}x_{i1} + \hat{\beta}_2 \sum_{i=1}^{n} x_{ik}x_{i2} + \ldots.. + \hat{\beta}_k \sum_{i=1}^{n} x_{ik}^2 = \sum_{i=1}^{n} x_{ik}y_i \text{ ……..(12)}$$

These equations are called the least squares normal equations. Note that there are p = k + 1 normal equations, one for each of the unknown regression

Defining Problem:

The problem of load forecasting is approached by making the forecasts for one whole day at a time. The approach is static in the sense that the forecast is not updated during the day. The forecasting of the load on the daily basis with neural network techniques has been reported in many variations. Single feed forward artificial neural network architecture is used in forecasting the daily peak, valley, and average loads.

These equations are called the least squares normal equations. Note that there are p = k + 1 normal equations, one for each of the unknown regression coefficients. The solution to the normal equations will be the least squares estimators of the regression coefficients $\hat{\beta}_0, \hat{\beta}_1, \ldots\ldots, \hat{\beta}_k$.

It is simpler to solve the normal equations if they are expressed in matrix notation. We now give a matrix development of the normal equations that parallels the development of equation (10, 11, 12). The model in terms of the observations, of the above equation may be written in matrix notation as Y = X β + € Where,

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ y_n \end{bmatrix}, \text{……..(13)}$$

$$X = \begin{bmatrix} 1 & x_{11} & x_{12} & x_{1k} \\ 1 & x_{21} & x_{22} & x_{2k} \\ 1 & x_{31} & x_{32} & x_{3k} \\ 1 & x_{n1} & x_{n2} & x_{nk} \end{bmatrix}, \text{……..(14)}$$

$$\beta = \begin{bmatrix} \beta_0 \\ \beta_1 \\ \beta_k \end{bmatrix} \quad \text{and} \quad \text{……..(15)}$$

$$\epsilon = \begin{bmatrix} \epsilon_1 \\ \epsilon_2 \\ \epsilon_n \end{bmatrix} \text{……..(16)}$$

In general, y is an (n x 1) vector of the observations, X is an (n x p) matrix of the levels of the independent variables, β is a (p x 1) vector of the regression coefficients, and € is an (n x 1) vector of random errors. We wish to find the vector of least squares estimators, $\hat{\beta}$ that minimizes

$$L = \sum_{i=1}^{n} \epsilon_i^2 = \epsilon' \epsilon = (y - x\beta)'(y - x\beta) \text{ ……..(17)}$$

Note that L may be expressed as

$$L = Y^1 Y - \beta^1 X^1 Y - Y^1 X \beta + \beta^1 X^1 X \beta$$
$$= Y^1 Y - 2\beta^1 X^1 Y + \beta^1 X^1 X \beta \text{……..(18)}$$

Because $\beta^1 X^1 Y$ is a (1 x 1) matrix, and its transpose $(\beta^1 X^1 Y)^1 = Y^1 X \beta$ is the same matrix. The least squares estimators must satisfy

$$\frac{\partial L}{\partial \beta}_{\hat{\beta}} = -2X^1 Y + 2X^1 X\hat{\beta} = 0 \text{ ……..(19)}$$

This simplifies to $X^1 X\hat{\beta} = X^1 Y$

equation (19) is the matrix form of the least squares normal equations. It is identical to equation (18). To solve the normal equations, multiply both sides of equation (15) by the inverse of X^1X. Thus, the least squares estimator of β is

$$\hat{\beta} = (X^1 X)^{-1} X^1 Y \text{ ……..(20)}$$

It is easy to see that the matrix form of the normal equations is identical to the scalar form. Writing out the above equation in detail we get If the indicated matrix multiplication is performed, the scalar form of the normal equations (i.e equations (3.4)) will result. In this form it is easy to see that X^1X is a (p x p) symmetric matrix and X^1Y is a (p x 1) column vector. Note the special structure of the X^1X matrix. The diagonal elements of X^1X are the sum of squares of the elements in the columns of X, and the off-diagonal elements are the sums of cross-products of the elements in the columns of X. Furthermore, note that the elements of X^1Y are the sums of cross-products of the columns of X and the observations $\{Y_i\}$.

$$\begin{bmatrix} n & \sum_{i=1}^{n} X_{i1} & \sum_{i=1}^{n} X_{i2} \cdots & \sum_{i=1}^{n} X_{ik} \\ \sum_{i=1}^{n} X_{i1} & \sum_{i=1}^{n} X_{i1}^2 & \sum_{i=1}^{n} X_{i1}X_{i2} \cdots & \sum_{i=1}^{n} X_{i1}X_{ik} \\ \vdots & \vdots & \vdots & \vdots \\ \sum_{i=1}^{n} X_{ik} & \sum_{i=1}^{n} X_{ik}X_{i1} & \sum_{i=1}^{n} X_{ik}X_{i2} \cdots & \sum_{i=1}^{n} X_{ik}^2 \end{bmatrix} \begin{bmatrix} \hat{\beta}_0 \\ \hat{\beta}_1 \\ \vdots \\ \hat{\beta}_k \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{n} Y_i \\ \sum_{i=1}^{n} X_{i1}Y_i \\ \vdots \\ \sum_{i=1}^{n} X_{ik}Y_i \end{bmatrix} \text{……..(21)}$$

The fitted regression model is

$$\hat{Y} = X\hat{\beta} \text{ ……..(22)}$$

In scalar notation, the fitted model is

$$\hat{Y}_i = \hat{\beta}_0 + \sum_{i=1}^{k} \hat{\beta}_j X_{ij} \qquad \text{……..(23)}$$

j = 1, 2… n.

The difference between the actual observation Y_i and the corresponding fitted value $\hat{Y}_i$ is the residual; say $e_i = Y_i - \hat{Y}_i$. the (n x 1) vector of residual is denoted by

$$e = Y - \hat{Y} \qquad \text{……..(24)}$$

ANN DESIGN:

ANN models work in the manner similar to human brain. In fact the basic ANN element is simulation of biological neuron. A biological neuron is composed of different parts performing different functions. Input information is received by the dendrites and act similar to the input node. These dendrites pass the information to soma the cell body or the processing node. The output of the soma is then transferred through the axon to the synapse. The synapse then gives a weight called synoptic weights to this information. This weighted input serves as the input to the dendrite of the next neuron. Brain consists of large number of such neurons with complex interconnections among them. The processing node in the human brain is a hard limiter. Since it is practically impossible to have such a large number of neurons and interconnection a continuous sigmoid function is used as a processing node in artificial simulation.

ANNs works on the basis of mapping of input/output spaces. The relationship between the input variables and the resulting responses there from are determined in an implicit manner. This is done through the training process. Training of the network is accomplished through the correction of the network weights given to each of variables using steepest gradient or other gradient method so as to minimize the sum squared error on responses. The general method of arriving at a neural network design is shown in figure 1. After gathering sample set of inputs and the related output responses (training samples) the network is trained. The learning parameters (learning constant, momentum etc) are adjusted till the network is trained successfully ie, with lowest possible sum squared error. The trained network is tested on the samples other than the training samples. The network parameters ie, number of layers and neurons in each layer are adjusted till successful testing of the network.For any neural network the design procedure involves, (i) feature selection (selection of input variables) and (ii) parameter selection for the network (number of layers, neurons etc). For the current load forecast problem the two procedures go hand in hand. In this case the dependence of the future load could be related to the load at various previous hours based on the past experience and judgment. However the suitability of selected set in modeling the said input/output relationship can only are verified by observing the performance of the network. A network which requires number of layers and neurons in a layer is selected which is fit to capture the input/output relationship. There is no fixed rule to decide the number of layers and neurons in each layer for a given problem. The number of layer depends on the complexity of the problem. It has been observed that a single hidden layer is sufficient for the problem. It is also found that 8-20 neurons in a single hidden layer capture the load pattern closely. For this appropriate number of training and testing patterns are selected from the historical data. It is also important to note that a network with low training error may not always lead to a good prediction, since forecasting not only requires good pattern matching but generalization as well. This balance between training and prediction error can be achieved by training the network of the said training patterns with a few number of epochs (say few thousand) then it is tested on test patterns. This training and testing continues till the prediction error or training error improves. This procedure may be repeated for other combination and one with lowest error is selected.

ANN Method :(Applications)

Selection of Network Architecture: (Maximum, Minimum, Average load)

There are numerous ways to choose the architecture of the models. Here a decision is made to use one network for all day types. It was concluded that networks with only one output node gives better results than forecasting peak-, valley-, and average loads with one multi-output node. Other features to be decided about the architecture of the network are the input variables and the number of hidden layer neuron variables. To forecast the maximum load L_{max} (*i*) (minimum and average loads) of a certain day, the maximum load (minimum, average loads) of the previous day can be considered as potential input variable. Therefore the network configuration can be summarized as given below: Note: number of neurons in a hidden layer can approximately be determined from the form H = T / {5(N+M)} Where, H= number of hidden layer neurons. N= size of the input layer M= size of the output layer T= size of the training set Training set: The training set for the networks consists of the data over one year, from April 1st, 1999 to March 31st, 2000.

The idea is that all load conditions are representative in the training in order to enable the model to adapt to all conditions. Therefore the size of the training set is 1×366Test data: The test data consisting data of one month from April 1st, 2000 to April 30th, 2000. Initialization of weights: Weights are opted to be initialized randomly Activation functions: The activation function used in the hidden layer is 'tan sigmoid'. The activation function used in output layer is 'purelinear'. Training algorithm: Batch training is adopted in training the said network. Gradient descent with momentum, which is a variation of back propagation algorithm, is used.

$$E_{avg} = \frac{1}{N}\sum_{i=1}^{N}\left[\frac{|\hat{L}_i - L_i|}{L_i}\right] * 100\% \text{ ……..(25)}$$

Where, N = the number of cases to be forecast (number of days in the cases of peak-, valley- and average load forecasting, and number of hours in the case of hourly load forecasting). L_i = the i[th] load value $\hat{L}_i$ = the i[th] load forecast

Defining the Problem (Hourly):

The problem of load forecasting is approached by making the forecasts for one hour at a time. The hourly load forecasts can be obtained either by forecasting the whole daily load curve at one time with a multiple-output network or by forecasting the load with a single-output network for one hour at a time. Here it has been used a network which has only one output node, which provides the forecasts for the next hour.

Selections of Network Architecture:

There are many alternative ways to build a multilayer feed forward artificial neural network for forecasting the hourly load. The most important decisions concern the selection of the input variables and the network architecture. The model consists of one feed forward artificial neural network which has one output node. This corresponds to L (*i*), the load at hour '*i*'. The input contains load data of the previous day as well as previous week in addition to the most recent hours. The load inputs therefore are:

L_k = L (*i*-k), where k=1, 2, 3

L_4 = L (*i*-24)

L_5 = L (*i*-168)

In addition to the load values, the network is also given with the inputs indicating the day type. Each day type is assigned with a binary value that gets the corresponding value of the target hour. The binary value assignments for each day are given below.

Sun001, Mon010, Tue011, Wed 1 0 0, Thu101, Fri1 1 0, Sat1 1 1

It was also concluded that including the input variables to inform the network of the hour of the day improves the forecasting accuracy significantly. The 24 hours of the days are encoded in five bit binary representation i.e. the first hour is encoded as 00001, second hour as 00010 and so on the twenty fourth hour as 11000.Training set: in the previous chapter, the date over the whole year was used for training a network to predict peak-, valley-, and average loads. The idea was to train the network to recognize the characteristics of all seasons. However, in forecasting the hourly load the training set is 24 times larger, and the networks also have to be larger. The training can become very exhaustive.

On the other hand, with a short training period the network can be trained fast. So short training sets consisting of one month and two months data are employed separately to train the same network architecture. For one month training, the training set is from December 1st, 2001 to December 31st, 2001. and for two months training, the training set is from November 1st, 2001 to December 31st,2001Test data: The test data consisting, data of one week from January 1st, 2002 to January 7th, 2002.Initialization of weights: Weights are opted to be initialized randomly Activation functions: The activation function used in the hidden layer is 'tan sigmoid'. The activation function used in output layer is 'log sigmoid'.

Test Results:

Defining the Problem (daily)

The problem of load forecasting is approached by making the forecasts for one hour at a time. The hourly load forecasts can be obtained either by forecasting the whole daily load curve at one time with a multiple-output network or by forecasting the load with a single-output network for one hour at a time. Here it has been used a network which has only one output node, which provides the forecasts for the next hour.

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There are many alternative ways to build a multilayer feed forward artificial neural network for forecasting the hourly load. The most important decisions concern the selection of the input variables and the network architecture. The model consists of one feed forward artificial neural network which has one output node. This corresponds to L (*i*), the load at hour '*i'*. The input contains load data of the previous day as well as previous week in addition to the most recent hours. The load inputs therefore are:

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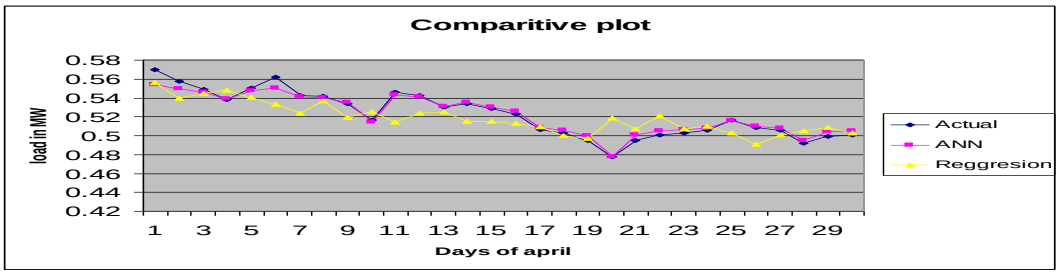
Test Results:

Defining the Problem (Hourly)

Hourly Load Forecasting With One Month Training Set Load data of the month of December 2001 is selected for one month training set. As December month contains 31days, altogether we have 744 hours (i.e. 31days*24hours). For each hour a column will be generated. As we have opted for 13 inputs each column contains 13 elements. So the size of input vector will be 13×744 and that of target vector will be 1×744. Testing is done for January 1st, 2002 to January 7th, 2002 (i.e., one week load data). So altogether testing is performed for 168 hours



Comparative Plot :(Avg. Load Demand)

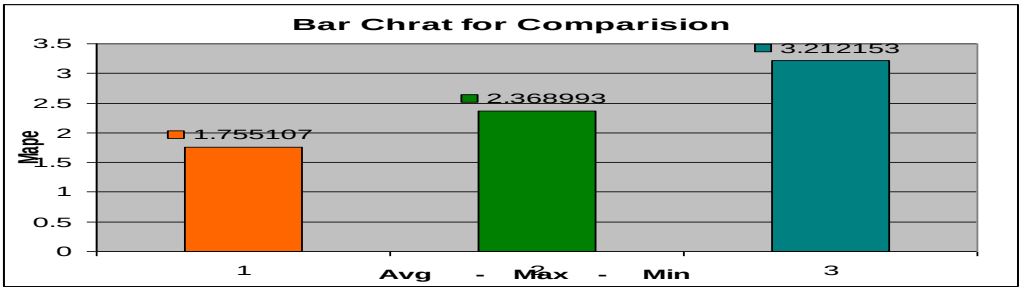


Figure2. Average Load Comparative between actual, ANN, Regression plot.

Figure 3. Mean Absolute Percentage Errors: The individual mean absolute percentage errors for all the days of test week are calculated separately. They are given in the table below:

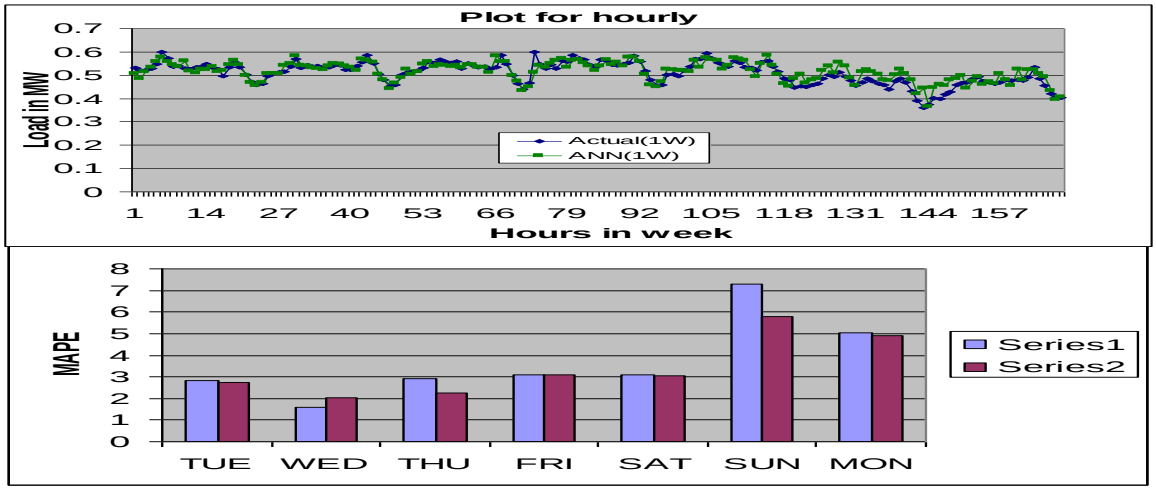


Figure4. In Bar Chart Plot of a week with one month train set

With 2 months training set:

Load data of the months November and December of 2001 are selected for two month training set. Now as the total numbers of days in the two months are 61, the total numbers of hours are 1464(i.e. 61 days*24 hours) for each hour a column will be generated. As we have opted for 13 inputs each column contains 13 elements. So the size of input vector will be 13×1464 and that of target vector will be 1×1464. Testing is done for January 1st, 2002 to January 7th, 2002 same week, on which the testing is performed with network using one month training set. So altogether testing is performed for 168 hours.

Figure5.Plot of a week with 2 months train set

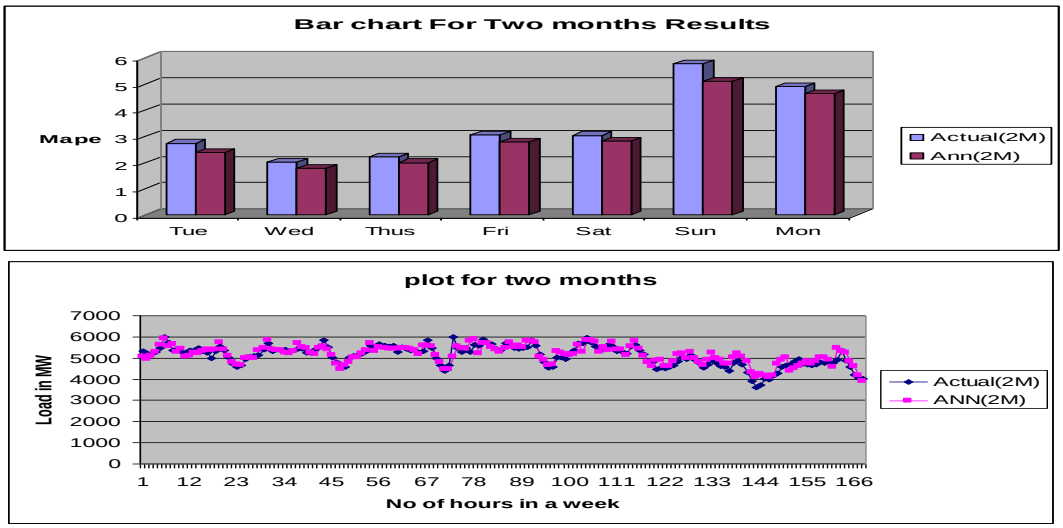
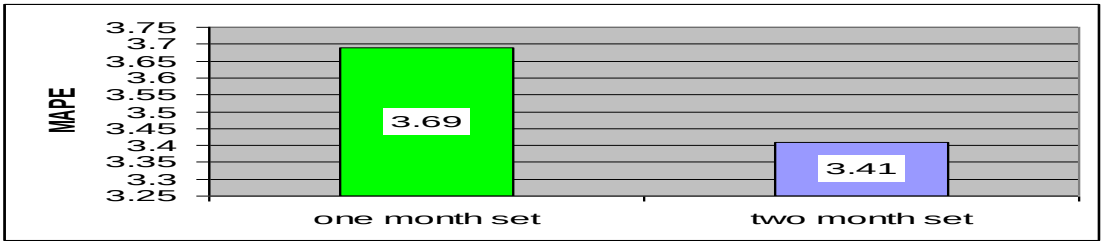


Figure 6. Bar chat comparison with one month and two months as training sets.



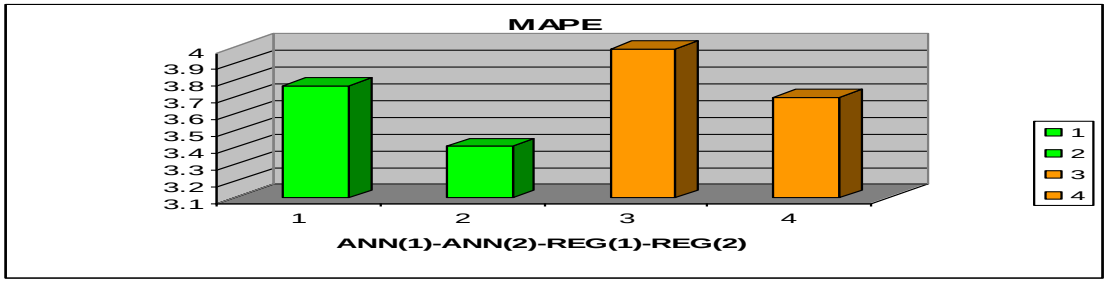


Figure 7. MAPE between ANN vs. Regression

CONCLUSIONS:

Several neural network models for short-term load forecasting were studied in this work. These techniques were divided into two classes: models for creating the forecast for one whole day at a time, and models utilizing the most recent load data and allowing the hourly forecasting. The focus was on discovering basic properties of different model types. This was considered necessary for the basis of a real forecasting application.

Hourly forecasting is perceived with average, peak, and valley loads. It was concluded that the forecasts for the average load are more accurate than those for the peak and valley loads. The problem with the daily forecasting models is that they don't allow updating during the day. If the forecast starts to go wrong, the models cannot make any changes on the basis of the most recent information, until at the end of the day. Therefore, if they were used in a real application, a method for making corrections in real time would be necessary. In this sense, the hour by hour models are more attractive. They allow hourly forecasting, and this clearly improves the accuracy for the closest hours.The idea to further improve the accuracy for the closest hours is endured by making the training set larger. It was concluded that training with two months gives in general better results than training with only one month.

Further improvement in the accuracy for the above said models can be achieved by including temperature data as input variable and also by finding some means to consider the effect, of anomalous load conditions, on forecasting during special holidays. As design of a problem in neural networks is basically a trail and error method, so several variations like changing the no. of hidden layers, hidden layer neurons, training algorithms, input variables, etc. are to be tried with. This should be done until optimum accuracy is reached, which makes these models suitable for real time energy management systems.

The test results were obtained using the load data of a particular case i.e. load dispatch centre located at Hyderabad. As this is only a single case, further evidence on other cases is desired. Without this, no conclusions on the generality and reliability of the model can be made. The next step related to this work is, therefore to implement the forecasting models and use it along with the current forecasting models on the data of several electric utilities. So it can be concluded that this project paves the way towards the process of creating a real time applicable neural network model.

Scope for Further Study:

1. The project stresses only the short term demand forecasting and the same approach can be extended to long term forecasting for predicting the values up to 5 years and above, for the purpose of power generation planning, system expansions etc.
2. Demand forecasting is carried out for state of Andhra Pradesh and also can be extended to all categories of consumption.

BIBLIOGRAPHY

1) A D Papalexopoulos, T Hasterberg. 'A Regression Based Approach to Short-term System Load Forecast.' IEEE Transactions on power systems, vol 5, no 4, November 1990, p1535.
2) S R Haung. 'Short-term Load Forecasting Using Threshold Autoregressive Models.' IEEE Proceedings on Generation, Transmission and Distribution, vol 144, no 5, September1997, p 477.
3) M T Hagen and S M Behr.'The time series approach to time series load forecasting.' IEEE Transactions, PRWS-2, vol 3, 1987, p 785.
4) K L S Sharma and A K Mahalnbis. 'Recursive short term load forecasting algorithm.' IEE Proceedings, vol 121, no 1, January 1974, p 59.
5) W R C hristiaanse. 'Short term load forecasting using general exponential smoothing', IEEE Transactions on Power Apparatus System, PAS-3, 1988, p 900.
6) G Gross and F D Galiana.' Short term load forecasting' IEEE Proceedings, vol 75, no 12, December 1987, p 1558.
7) D. Singh, etal," ANN Based Short Term Load Forecaster", Journal of IE (I), Vol 82, sep 2001, p.p 161 – 166.
9) J.K.Mandal, et. al, "Application of ANN for Short Term Load Forecasting in Electrical Power Systems", Journal of IE(I), vol.77, May1966, pp 40 – 43.
10) Dave Anderson and George Mc Neill (Web support) "Artificial Neural Networks Technology."
12) Neural Network Toolbox for use with MATLAB from MATHWORKS.COM
13) Load data has been taken from LOAD DISPATCH CENTER at APGENCO, Hyderabad.
14) One Hour Ahead Load Forecasting using Neural Networks – IEEE Trans, Vol.17, Feb'02
15) Electric Power Systems Load Forecasting – IEEE DEE, FEIS, Brazil
16) Use of ANN for Electrical Load Forecasting – Journal of the Institution of Engineers
17) Load forecasting by Dr. C.Lakshminarayana
18) Electric utility transmission systems, engineering staff college of India
19) Dr. R.L.Sullivan "Power system planning" Power System Planning,McGraw-Hill Inc., US, First (1st) Printing
20) Jacek .M. Zurada, "Introduction to Artificial Neural Systems", Jaico Publishing House
21) B.Yegnanarayana, "Artificial Neural Networks", Yegnanarayana B, PHI
22) Pabla, A. S."Electric Power Distribution", 6th Edition, Tata McGraw-Hill Education, 2011.
23) Turan Gonen" Electric Power Distribution Systems", CRC Press, 2006.
24) Dr.M.K.Khedkar,Dr. G.M. Dhole,"A Textbook of Electric Power Distribution Automation", Lakshmi Publications, Ltd., 2010

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Efirstaid Medical Services for Accident Cases

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ABSTRACT:
From a newspaper survey, it is badly noted that for every second, 5 people in India meet accidents and lose their life. The main course of loss of life in accidents is due to the unavailability of quick first aid medical service. To overcome this problem, Government and private aid centre run mobile ambulance service. Due to delayed communication between the accident spots and service departments, fast first aid and medical assistance for the people who suffer in accident spot have not provided in correct time. There is also another problem of intimating the accident if it occurs in remote areas. Though the medical service reached spot, it has to test the victim's blood group to give the appropriate blood suits his blood current. These are the barriers considered by us and find the solution through this work

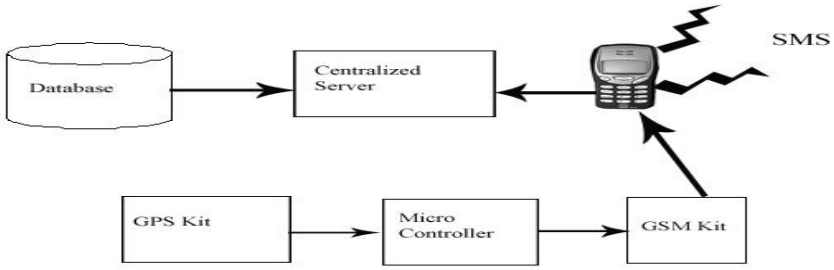
Keywords**:** *AT, GSM, GPS, PHP, SQL, SMS*

I. INTRODUCTION

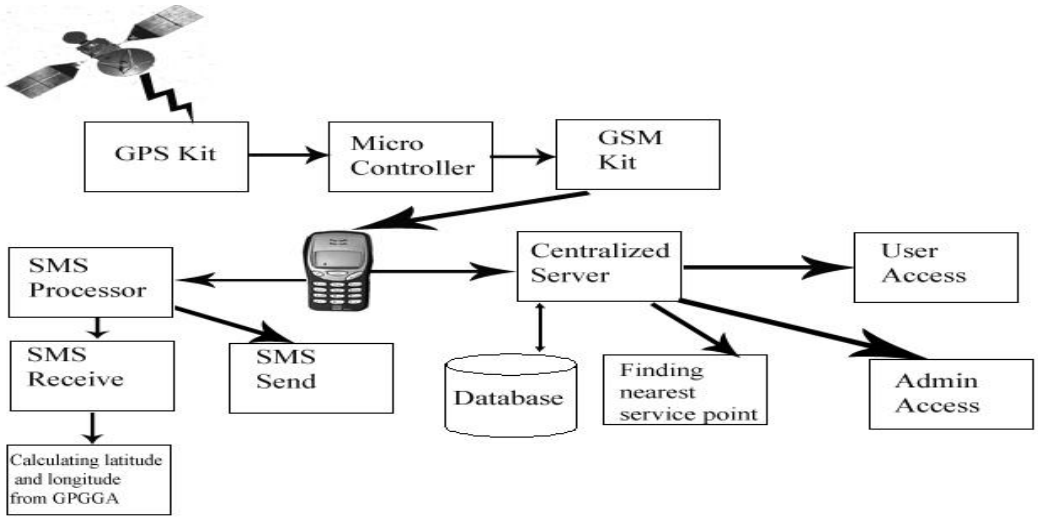
Web Technology, Mobile Technology and Embedded Technology are the most vital blocks of any fields in current situation. By making fusion of these technologies, tremendous benefits can be made for both scientific and commercial use. Database Management is an another unavoidable concept in every technology. Web Technology is the most wanted in recent trends to keep in touch with world in 24 X 7. To make optimized use of both embedded and mobile technology meet the crown when they are joined by the web. Internet is the most shortlisted necessity for all kinds of people and various fields of business and services. By maintaining database in the server side, this project can service our clients rely on their requests. Concerning with web technology, it should be both security and easy usage to the clients for efficient service. The website also has to consider the speed of loading and current trends. PHP addresses all these issues.In the Embedded unit, (i.e) The hardware unit which operates as by processor (software) defined by the programmer. Typically, an embedded system is resident on a microprocessor or microcontroller (eg. 89C52) board with the programs stored in memory (ROM). Virtually all appliances that have a digital interface - watches, microwaves, VCRs, cars utilize embedded systems. Some embedded systems include an operating system, but many are so specialized that the entire logic can be implemented as a single program. An effective predefined program is burnt inside the microcontroller that performs as instructed. By instructing, the microcontroller can interface third vendor device to embedded unit and also we can direct that device as by our logic. Eg. GSM modem, GPS receiver. In the Mobile Technology, the project uses the GSM Modem (i e) Global System for Mobile communication. It is the heart of mobile phone for message and voice communication. It can also be used also in an isolated form. The GSM modem can be interfaced to the controller kit for messaging and even for dialing communication. Another most hot topic discussed now a days is the G P S (Global Positioning System) . It also be used in an isolated form. There are number of satellites dedicated for tracking any portion of the earth. So there is a chance to figure out small sand particles by latitude and longitude position (Geo Coordinates). Making fusion of both working of GSM and GPS devices is another important module.The project (E Firstaid Medical Service for Accident Cases) makes use of all above technologies and techniques.

II. SYSTEM DESIGN

The block diagram gives the system model of our project. It tells the links between the nodes for transmission, reception and processing of the data. Nodes here mentioned are embedded kit, GSM, GPS, Server, Database and mobile phone. Interfacing between all these nodes is also major important part of system model , hence they act as protocols for the communication between the node.



III. SYSTEM DEVELOPMENT



The Embedded Module of this project consists of three main parts. They are as follows,

- GPS Kit
- GSM Kit
- Controller Kit

The embedded kit designed with these three core parts is fixed into the vehicle. This kit operates at a very low voltage of 12V so the power can be easily got from the vehicle's battery.

A. GPS KIT:

The GPS (Global Positioning System) kit consists of a receiver which receives messages from the satellites rounding over the earth. Using messages received from a minimum of four visible satellites, a GPS receiver is able to determine the times sent and then the satellite positions corresponding to these times sent. The x, y, and z components of position, and the time sent, are designated as $[x_i, y_i, z_i, t_i]$where the subscript *i* is the satellite number and has the value 1, 2, 3, or 4. Knowing the indicated time the message was receivedtr, the GPS receiver can compute the transit time of the message as$(tr-t_i)$. Assuming the message travelled at the speed of light, c, the distance travelled, Pican be computed as$(tr-t_i)c$.A satellite's position and distance from the receiver define a spherical surface, centred on the satellite. The position of the receiver is somewhere on this surface. Thus with four satellites, the indicated position of the GPS receiver is at or near the intersection of the surfaces of four spheres.The GPS kit will return back the position in the GPGGA sentence.

B.GSM KIT:

The GSM kit is used in our project for sending of sms. The GSM Kit works in two mode. They are Text Mode and PDU Mode. The AT commands are used to control the operation of the kit. The kit will function at the baud rate of 9600.The command AT+CMGF=1 is used to set the sms format in Text Mode. The command AT+CMGS is to send the sms to the desired number.

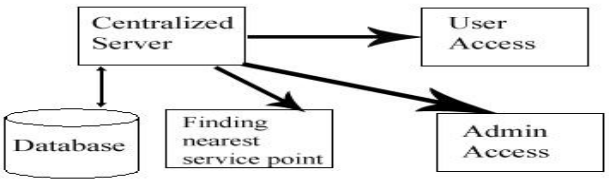
E.g AT+CMGS="9500252559" will send the sms to the mobile number 9500252559.

C.CONTROLLER KIT:

The 89C52 microcontroller is used in the project for controlling the GSM kit and GPS Kit. The Controller kit periodically receives the GPS signals and sends it to the centralised server using the GSM Modem via SMS. The kit was programmed using Embedded C to perform this operation. It was programmed such that it addresses the issue in difference in baud rate between the GPS kit and the GSM modem. If any accident occurs the kit sends the special SMS with the current position. That special SMS was prefixed with ACC to differentiate that from other ordinary SMS.

D.WEB MODULE

The Web Module of the project involves the creation of a centralized server and the creation of Global database. The database consists the details of the user information and the details of the service points.



E.CENTRALIZED SERVER

It is designed using web development language PHP. It is accessed by user as well as administrator. It provides 24X7 services to the society and it keep track the user by monitoring the database updates.

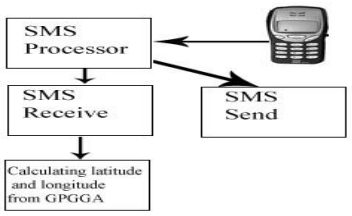
USER

User can perform the following operations

- New registration
- Edit profile
- Change password
- Drop profile

F.PC-MOBILE MODULE

This module is programmed using Visual Basic 6. In this module the interaction between the Mobile and the PC takes place. The database is the same database used by the Web Module.



The SMS sent from the GSM Modem fixed in the moving vehicle is received by the mobile connected to the PC. All the SMS received by the mobile is stored in the table SMSBASE. If the SMS received is the special SMS (i.e if it containd ACC) then it is stored in the SMSACC table. The smsbase table consists the timestamp, therefore it can be also used as the SMSlog.

E.GEO COORDINATES CONVERSION

The SMS received by the mobile is only in the GPGGA format. So, before storing that SMS into the database it has to be converted in to latitude & longitude. To calculate latitude from the GPGGA sentence the second value from is taken, the first 2 letters is added with the remaining divided by 60. e.g: 4924.6633=49+(24.6633/60). To calculate longitude from the GPGGA sentence the fourth value is taken, the first 3 letters is added with thee remaining divided by 60. E.g:08151.6453= 081+(51.6453/60)

F. SMS SEND

The SMSPOLL table consists of the SMS text and the SMS number and a flag to denote the sending of SMS. If the flag is not set means, then the SMS is sent to the number which is available in the SMSPOLL table. For sending of SMS a list box is maintained. The List box is treated as the queue. The SMS is sent to the numbers present in the list one by one. After the SMS is sent the flag available in the SMSPOLL table is set to TRUE, indicating that the SMS has sent.

IV. CONCLUSION

In the older system, only manual help for both processing information and intimating the event. And also there is no system database for all the people using the roadways for usage in case of accident. There is no system for intimating the location of accident to the service point without the third party concern. But our application of combining embedded, web and mobile technologies extract the optimized solution for all barriers mentioned above. This is the complete system of information technology for the commercial use.This application act as life guard of them. Making the optimized use of GOLDEN HOUR, intimating the accident with location details to the centralized server, by processing the message with user id, server intimate the appropriate nearby service point and police station and also to the well wisher of the user. Service point reaches the spot with require blood group based on data in server. User can upload their information independently in the user friendly website. In future this project can be enhanced in the following ways. There is enhancement in strong detection of accident, by using core electronics sensor application. There also area of opportunity to enhance this project to send severity of accident by sensing the damage of the vehicle. It helps the service point to act upon that information for servicing the victim.

REFERENCES

[1.] Mandellos, G.J. Lymperopoulos, D.K. Koukias, M.N. Tzes, A. Lazarou, N. Vagianos, C. "A novel mobile telemedicine system for ambulance transport. Design and evaluation" IEEE paper in Engineering in medicine and Biology Society,2004 pages 3080-3083

[2.] Tsuyoshi Okada, Takumi Ajima, "Emergency Assistance System for Automobile Accidents"- Google patent search

[3.] Coats, TJ; Davies, G. "Prehospital care for road traffic casualties". BMJ. 2002;324:1135–1138. .

[4.] K.Mohanraj, S.Prabakaran, R.Ananth, M.Jeyapriya, "Application of GIS in Accident Management System".

[5.] Stroh, G; Braude, D. Can an out-of-hospital cervical spine clearance protocol identify all patients with injuries? An argument for selective immobilization. *Ann Emerg Med*. 2001;37:609–615.

[6.] Christopher cosentino,"Advanced PHP for Web Professionals "

[7.] Danny Goodman ,"Javascript Bible "

[8.] David Powers, "PHP Solutions:Dynamic web design made easy"

Comparative study of capacitance of Nano-Scale and Pico-scale-MOSFET

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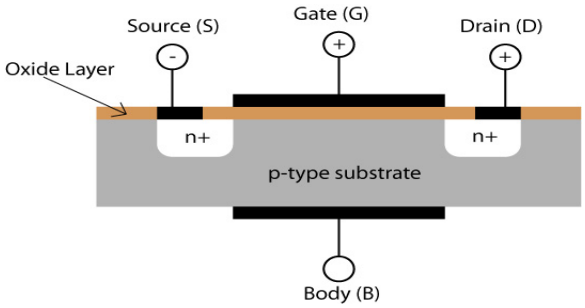
ABSTRACT

As CMOS technology dimensions are being aggressively scaled to reach a limit where device performance must be assessed against fundamental limits, pico scale device modeling is needed to provide innovative new MOS devices as well as to understand the limits of the scaling process. This paper presents a comparison between nanoscale and pico scale MOSFETs from the viewpoint of device physics. The MOS capacitance for different dielectric is compared for device dimensions in nanometer and pico meter using MATLAB.

Keywords: *Channel length, Gate oxide thickness, Gate capacitance, dielectric constant, nanometer, Pico meter, Threshold voltage.*

I. INTRODUCTION

The metal–oxide–semiconductor field-effect transistor (MOSFET, MOS-FET, or MOS FET) is a transistor used for amplifying or switching electronic signals. The MOSFET behaves as a capacitor as there is a dielectric layer in between semiconductor and metal.



The gate of the Mos is a good capacitor. Its capacitance attracts the Charges to invert the channel. So, Higher the capacitance higher will be drain current.

Capacitance Comparison

We have

$C_g = C_{ox}WL$

C_g = Gate capacitance, W= width of dielectric,

C_{ox}=oxide capacitance, L = Length of dielectric

We have,

$C_{ox} = \epsilon_{ox}/ t_{ox}$

t_{ox} = Thickness of dielectric .

$\epsilon_{ox} = K \epsilon_0$

ϵ_0= permittivity in free space

k = Dielectric constant

Materials	Dielectric constant
1. Acetamide	4
2. Acetic acid	4.1
3. Anisole	4.3
4. Amylamine	4.6
5. Benzyl benzoate	4.8
6. Benzyl acetate	5
7. Boronyl chloride	5.2
8. Bromohexane	5.8
9. Amyl Bromide	6.3
10. Ammonium chloride	7
11. Apatite	7.4
12. Decanal	8.1
13. Ethyl carbonate	14.2

We have k (Sio2) = 3.9

And the value of thickness and width of the have taken up to 5 nanometer.

Let us change the value of dielectric constant (K):

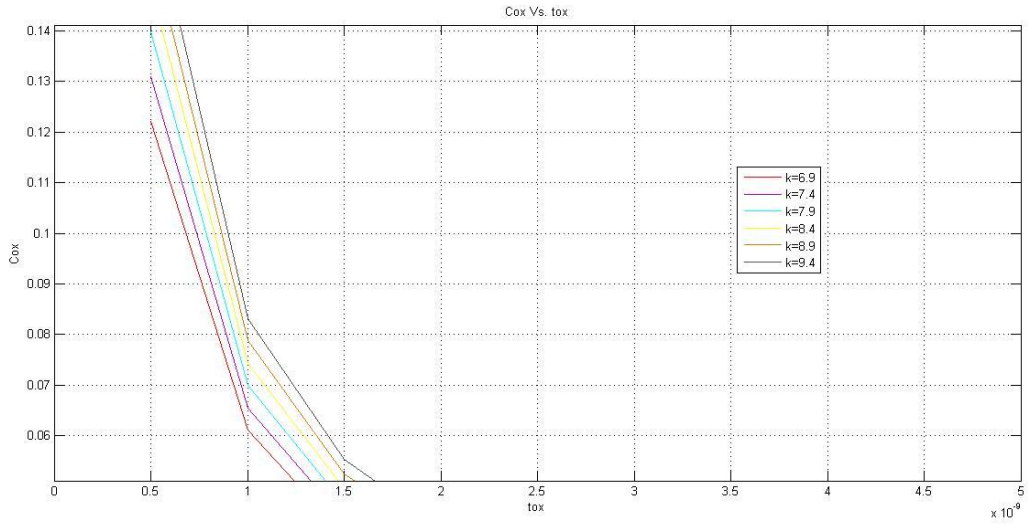
1) If k < 3.9 , Threshold voltage Increases.
2) If k > 3.9 , Threshold voltage Decreases.

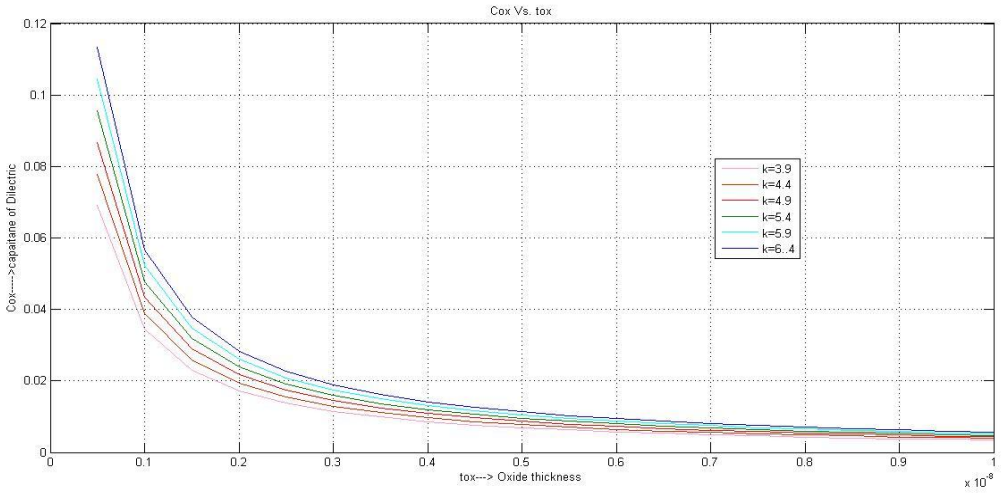
So changing the value of k where k > 3.9

And take the value of W, L in bellow 5 nanometer.

If we plot Cox Vs Tox

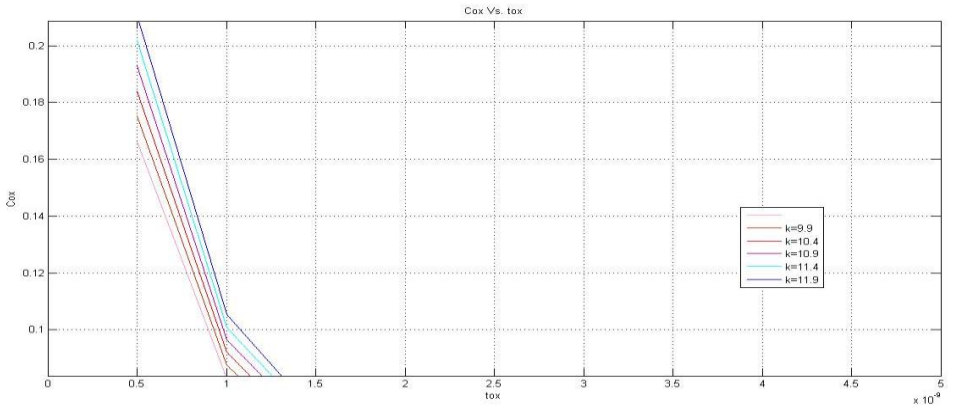
1) Taking the value of Tox in Nanometer

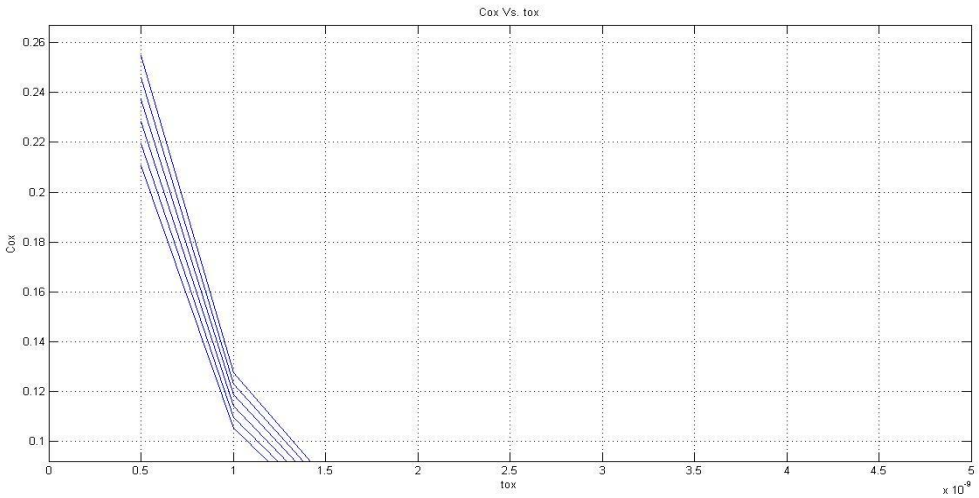




k=3.9 to 6.4

k=6.9 to 9.4

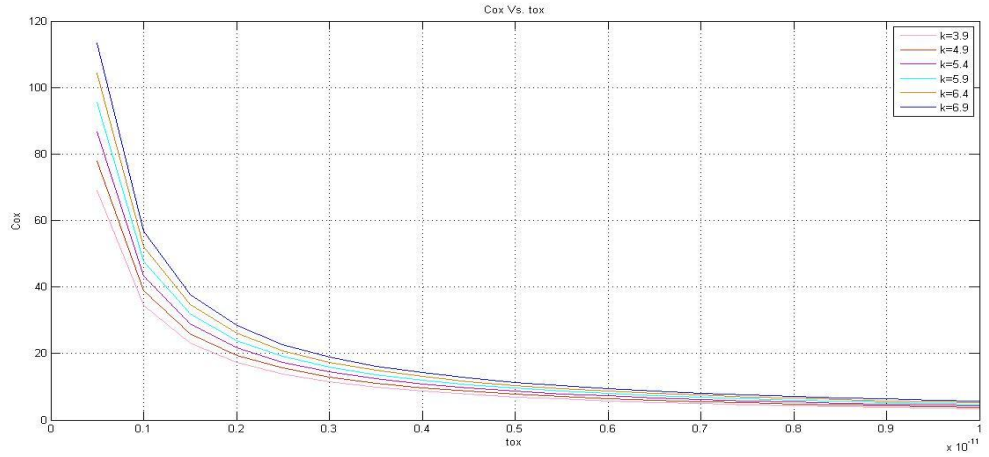




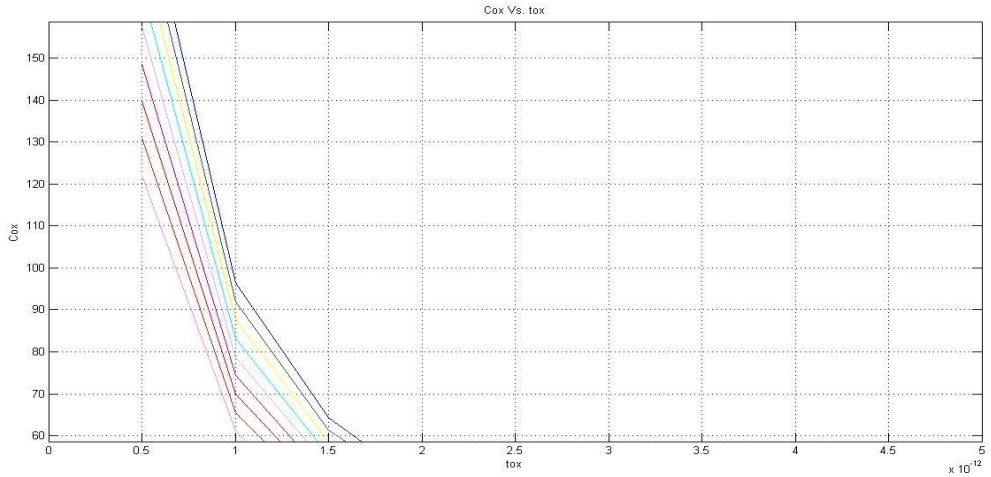
k=9.9 to 11.9

k=11.9 to 14.4

2) Taking the Tox in Picometer



K=3.9 to 6.9
K=7.4 to 11.9

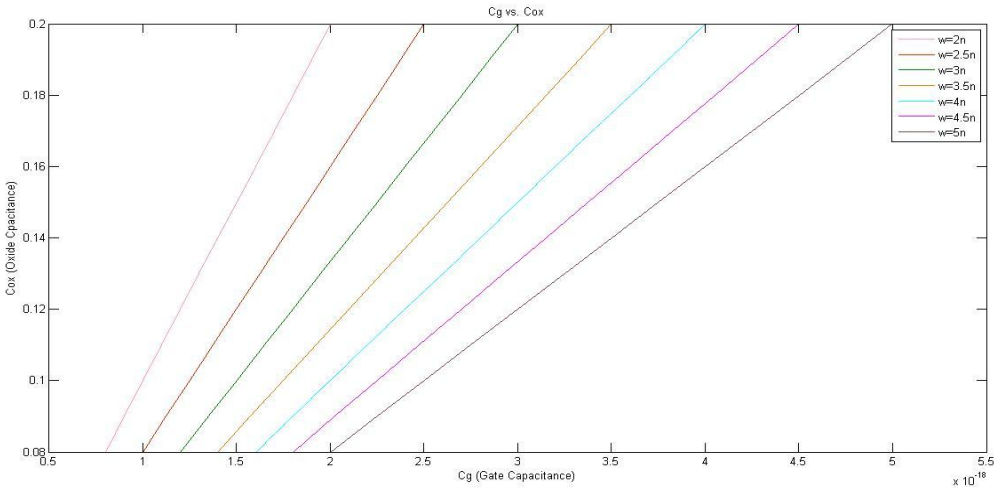


To study Cg vs. Cox

We have

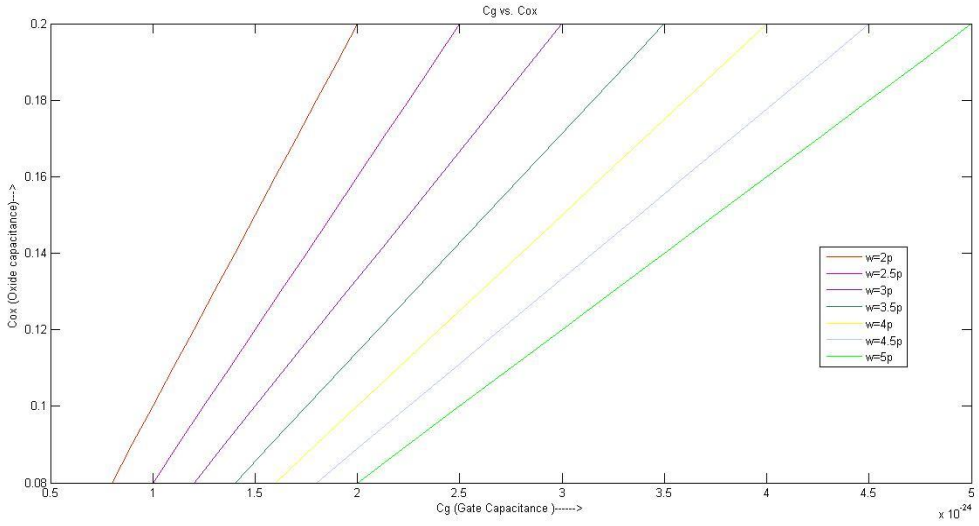
Cg = Cox W L

From above plotted graphs, using Cox= 0.08:0.01:0.20;



Case 1: taking W in nanometer

W=2 to 5nm



Case 2: W in picometer

W=2 to 5 pm

CONCLUSION

There are a number of issues in scaling MOSFET devices, particularly for the sub-100 nm technology evolution. The most critical issue is the gate dielectric, because very thin gate oxides are required for sub-100 nm generations. For such thin oxides, gate leakage current due to direct tunneling becomes unacceptably large. In order to decrease the leakage current due to tunneling, the physical thickness of the dielectric must increase, while the equivalent oxide thickness must continue to be reduced. Use of alternate gate materials with dielectric constant higher than that of silicon dioxide is the leading projected solution to reduce the gate leakage current to more tolerable levels. Therefore, modeling of the thin oxide related issues, such as gate direct tunneling current, gate capacitance, and capacitance reconstruction are crucial for further gate oxide scaling.

ACKNOWLEDGEMENTS

On the very outset of this report, we would like to extend our sincere & heartiest obligation towards all the personages who have helped us in this Endeavour. Without their active guidance, help, co-operation & encouragement, we would not have made headway in the project.

We would also like to thank **Mr. Arindum Mukherjee (HoD i/c, Dept of ECE, CIT Kokrajhar)**, to give us the chance to do this work and all the staff members of ECE dept. for their motivation, guidance and support throughout the project First and foremost, we would like to thank **Mr. Haradhan Chel (Asst. professor, Dept of ECE, CIT Kokrajhar)** who instead of his busy schedule, always guided us in the right direction. We were privileged to experience a sustained enthusiastic and involved interest from his side. This fuelled our enthusiasm even further and encouraged us to boldly step into what was a totally dark and unexplored expanse before us. He always fuelled our thoughts to think broad and out of the box.

REFERENCES

[1] "Modeling of nanoscale mosfets"ChanghoonChoi ,April 2002
[2] H. Iwai, "Current Status and Future of Advanced CMOS Technologies:Digital and Analog Aspects,"1998
[3] R. Viswanathan, and et al.,"CMOSscaling into nanometer regime,"Proceedings of IEEE, Apr. 1997.
[4] "International TechnologyRoadmapfor Semiconductors 2000 Edition,"2000.
[5] E. J. Lerner, "The End of the Road for Moore's Law," Journal of IBM research, 1999.
[6] P.A.Packan,"Pushing the Limits," Sep. 1999
[7] C. Fiegna and A. Abramo "Analysisof Quantum Effects in Nonuniformly Doped MOS Structures," IEEETrans. Electron Devices, Apr. 1998.
[8] H. Iwai, "CMOS Technology – Year2010 and Beyond," IEEE J. of Solid-StateCircuits, Mar. 1999.

Increasing the Comprehensibility of Oscillation based Built-In Self Test (OBIST) using Frequency to Fault Code Converter

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Abstract:
A new strategy to increase the comprehensibility of Oscillation based Built-In Self Test (OBIST) of either a SOC or part of a complex mixed-signal system is described. In the test mode, a circuit under test (CUT) is transformed to an oscillator providing a feedback to the CUT. The oscillation frequency is then converted to a corresponding fault code using a new concept of Point of Coincidence (POC).

Index Terms: *Frequency to fault code Converter, Built-in self test (BIST), Oscillation based Built-In Self Test (OBIST), Circuit under Test (CUT), Point of Coincidence (POC), mixed-signal test, fault detection, level crossing detector (LCD)*

I. INTRODUCTION

Increasing the integration density enables, production of complex analog and mixed-signal integrated systems, this in recent years have motivated system designers and test-engineers to shift their research interest direction towards this particular area of very high large-scale integrated circuits and systems to develop specifically their effective test strategies [1],[2]. Mixed-signal and analog integrated circuit fabrication process involves a series of steps, which in real world aren't perfect and results in imperfections. Such imperfections may lead to failures in the operation of the individual integrated circuits, more so in case mixed-signal and analog integrated circuits. This is why every integrated circuit must be rigorously tested before being shipped to their vendors or customers. Testing not just improves the overall quality of the final product, but also can be a strategy for validating design and the technology.

Development of new test method strategies and approaches represents an important task of testing complex embedded systems. Performing test part by part could be the proper and possible test approach in some applications. Such approach is based on dividing the complex system into small parts that can be easily tested separately [3], [4]. Almost every mixed-signal integrated system contains circuits such as operational amplifiers, filters, oscillators, PLLs etc. During the test mode, all these circuits can be transformed into an oscillator by connecting some additional circuitry i.e., a feedback network. If possible faults are indeed present in the Circuit under Test (CUT), this would cause a deviation in the oscillation parameters like amplitude of the oscillations, oscillation frequency and so on. Hence making it possible not just determine if the device is faulty or fault free, but also pin-point the exact location of the fault.

To make the OBIST model more comprehensible, robust and efficient, we propose Frequency to Fault Code converter; this is evaluated by comparing the oscillation frequency taken from a CUT with a reference frequency.

II. PROPOSED TEST STRATEGY

2.1. Building a CUT

Many techniques have been proposed in the literature for converting a CUT into an oscillator using appropriate circuitry. One way to design a sinusoidal oscillator from the CUT is to connect the output terminal of the device to be tested to the input terminal. It is important to check the circuit satisfies Barkhausen's Criterion [5]. For this experiment, we use a simple RC phase-shift oscillator as shown in Fig. 1.

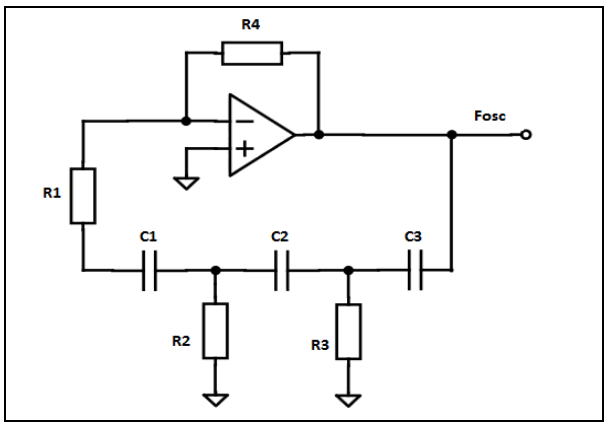

Fig.1 RC Phase-Shift oscillator

2.2. Reference Oscillator

To relate the frequency from CUT to a corresponding code, the experiment requires the use of a reference frequency. To achieve this, it is important to make use of a simple precise oscillator. This device makes use of a Schmitt oscillator, depicted in Fig. 2.

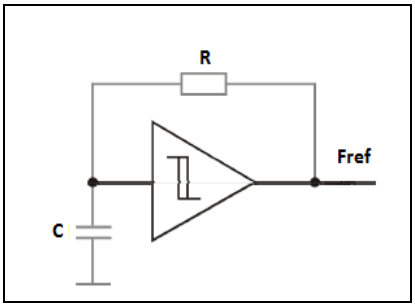

Fig. 2 A simple Schmitt oscillator

Reference frequency can be given by

$$Fref = \frac{1}{RC \cdot \ln\left[\frac{(VDD - VSPH).\ VSPH}{(VDD - VSPL).VSPL}\right]} \quad \ldots(1)$$

where, V_{DD} is the power supply voltage, V_{SPH} and V_{SPL} is the high and the low threshold voltage value of Schmitt trigger, respectively.

2.3. Test procedure

The output signals from the CUT and reference oscillator is passed through level-crossing detectors (LCD) and digital pulse for each of the signals is obtained. These digital pulses are input to a digital system which contains the following modules viz. counter and edge detection blocks. The block diagram of the proposed test procedure is depicted in Fig. 3.

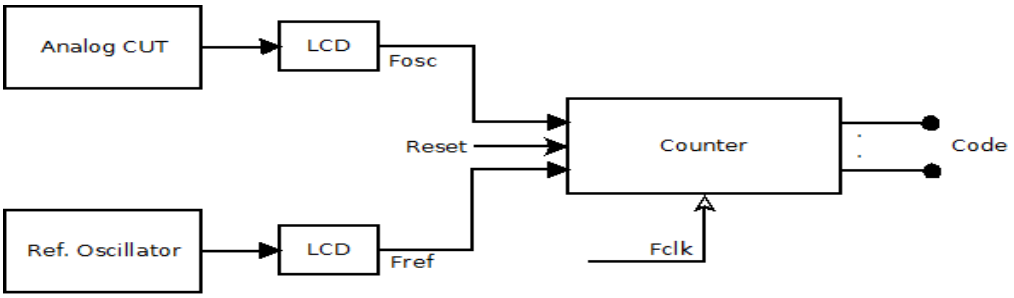

Fig. 3 Test methodology block diagram for frequency to fault code converter

The counter is a simple 16-bit up-counter, it counts until an event from the edge detection circuitry triggers the counter to stop. This happens when the falling edge of the digital pulses from the CUT and reference oscillator coincides, the count on the counter corresponds to the oscillation frequency. The F_{ref} is assumed to be much greater than F_{osc}, this is because the probability of coincidence increases significantly. It is also to be noted that F_{ref} is kept constant for the entirety of the experiment.

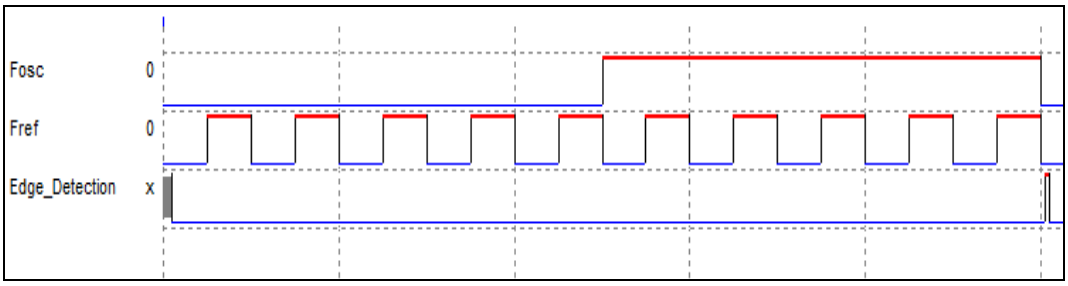

Fig. 4 Waveform depicting Point of Coincidence

The two frequencies, the oscillation frequency (F_{osc}) from the CUT and reference frequency (F_{ref}) from the external circuitry are compared to correspond to a number (N_{POC}). The two frequencies are compared for coinciding falling edge, called the Point of Coincidence, as depicted in Fig. 4. Falling edge is considered, this is because the experiment assumes the input signals to be falling at the start. When the falling edge of F_{osc} coincides with the falling edge of the falling edge of F_{ref}, the event is registered and counter is deactivated and the count corresponds to the fault code for that value of F_{osc}.

In the flowchart, as elucidated in Fig. 5, the module checks the frequencies from the CUT and the reference oscillator for falling edges. Once the falling edge of both the oscillation and the reference frequency is encountered at the same as shown in Fig. 4, the counter is disabled i.e., stops counting.

The clock for the counter (F_{clk}), is independent of the F_{osc}, this is because, if F_{osc} were to be F_{clk}, the sensitivity of the counter would be really low. For this reason, F_{clk} is chosen to higher than F_{ref} and F_{osc}.

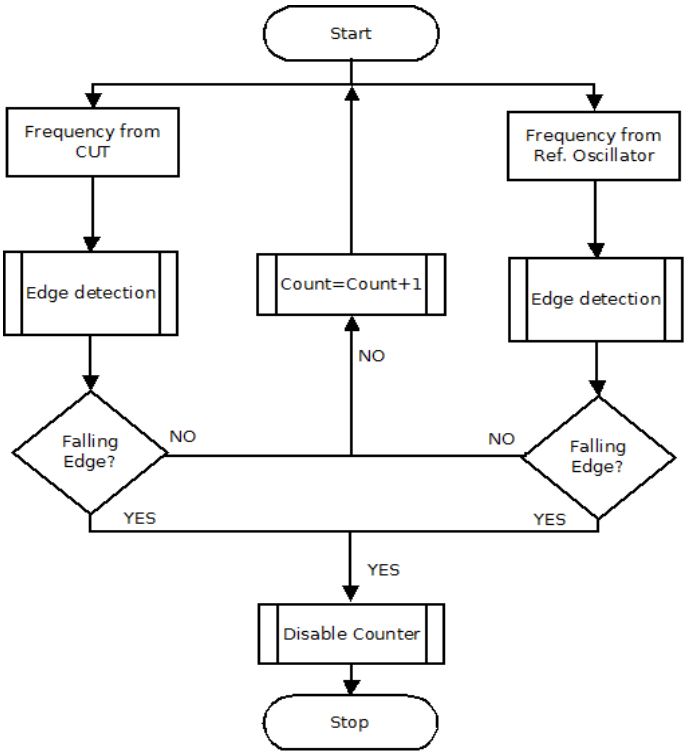

Fig. 5 Flowchart for counter module of the frequency to fault code converter

2.4. Formulation

Let say, F_{osc} = 10MHz and F_{ref} = 100MHz.
This implies, $T_{osc} = 1 / F_{osc}$ = 100ns.
Similarly, $T_{ref} = 1 / F_{ref}$ = 10ns.

T_{POC} i.e., time it takes to get to the point of incidence is estimated by the equation,

$$T_{POC} = LCM (T_{osc}, T_{ref}) \quad \ldots(2)$$

Therefore, using the equation 2, T_{POC} for F_{osc}, when F_{ref} is kept at 100MHz is,

T_{POC} = LCM (100, 10) = 100ns.

Simulation result for the above example is depicted in Fig. 6.

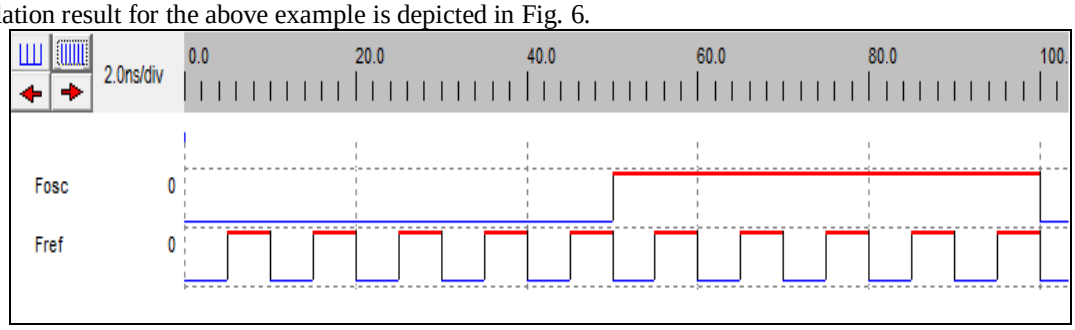

Fig. 6 Waveform depicting the example for estimating T_{POC}

Since, the counter increments at every rising edge of the clock (F_{clk}), therefore it is safe to assume that, the fault code (N_{POC}) is,

$$N_{POC} = T_{POC} / T_{clk} \quad \ldots(3)$$

Say, for the same example, if T_{POC} = 100ns, and T_{clk} = 5ns.

From equation 3, N_{POC} = 100/5 = 20, the result is depicted in Fig. 7.

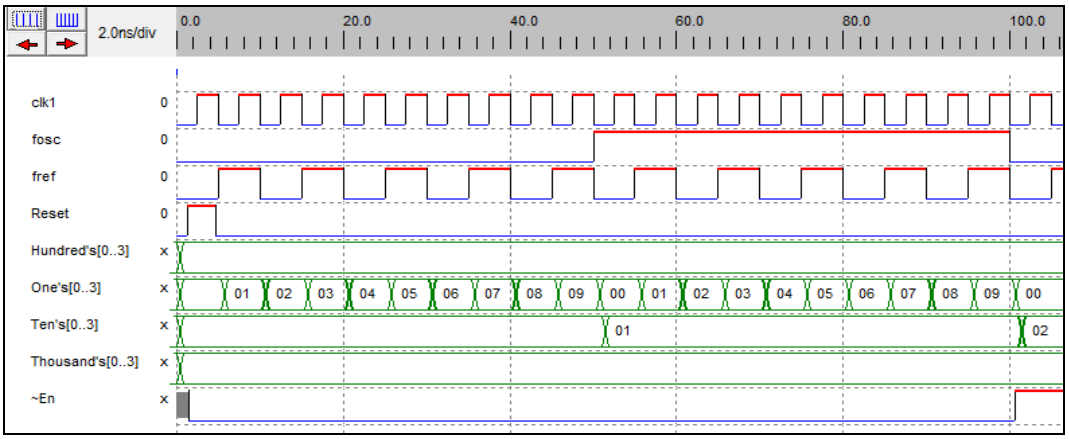

Fig. 7 Waveform depicting the example for estimating N_{POC}

III. RESULTS ACHIEVED AND OBSERVATIONS

This experiment considered RC phase shift oscillator as the CUT. First fault-free oscillation was considered, and the fault code corresponding to it was found out. For fault-detection, faults were injected into the CUT. In this experiment, only catastrophic faults were considered. The component was stuck-short by adding a 10Ω resistor in parallel and stuck-open by adding a 100MΩ resistor in series as shown in Fig. 8. Value of the F_{ref} was kept constant at 20kHz for the entirety of the experiment.

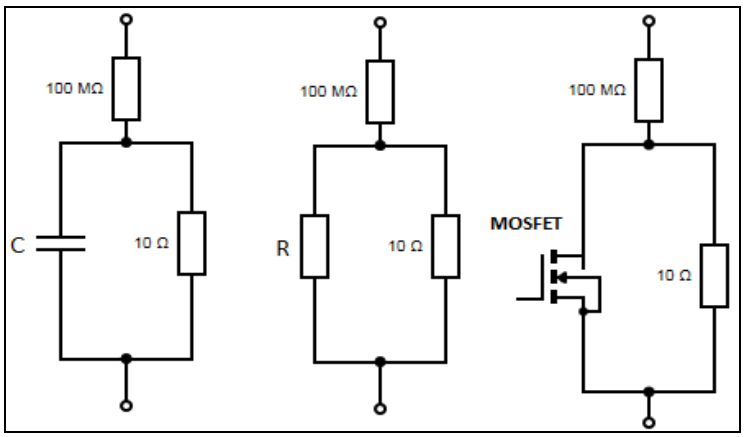

Fig. 8 Stuck-open and stuck-short fault models for capacitor, resistor and MOSFET

Table 1
Simulation results for RC phase-shift oscillator

Faults	Output oscillation freq. of CUT(kHz)	Fault Code (Hex)
Fault free	**5**	**A**
R1 short	4.68	10B
R2 short	7.32	AA
R3 short	8.88	8E
R4 open	1.62	304
C2 open	5.074	F7
C3 open	5.039	E6
Other faults	**No oscillations**	

IV. CONCLUSION

This paper investigates the implementation of Frequency to Fault Code converter using the concept of the point of coincidence, and proposed the integration of Frequency to Fault Code converter and OBIST. The experiment yielded gainful results and can be employed for testing complex analog and mixed-signal integrated circuits.

V. FUTURE SCOPE

This work can be further extended into developing an external testing module, for testing a number of different prototypes. This module can work by reading the values from the Frequency to Fault Code converter viz. the CUT, and look up for that CUTs' derived fault list for result against each code. Each CUT should have the fault list database and must be preloaded into the external testing module.

REFERENCES

[1] Sunil R. Das, Jila Z., Satyendra Biswas et al. "*Testing Analog and Mixed-Signal Circuits Built-In Hardware-A new approach*". IEEE Transactions on Instrumentation and Measurement. Vol 57. No.3. 2007

[2] Jose L. Huertas. "*Test and Design for Testability in Mixed-Signal Integrated Circuits*". Kluwer Academic Publications. 2004. Pages 1-4.

[3] Daniel Arbet. "*Parametric Test and Fault Detection in Mixed-Signal System sub-circuits*". PAD. 1997. pp 166-171

[4] K. Grunett and T. Adams. "*Advanced Devices, Advanced Testing, Semiconductor manufacturing*". Vol 6. pp. 9-14.

[5] Adel S Sedra and Kenneth Smith. *"Microelectronics Circuits- Theory and Applications"*. Oxford International Student Edition. Fifth Edition. 2009. Pp 1001-1003.

Smart Message Communication for Warrior

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Abstract:

Message Service is getting more popular now-a-days. Message (SMS) was first used in December 1992, when Neil Pap worth, a 22-year-old test engineer used a personal computer to send the text message "Merry Christmas" via the Vodafone GSM network to the phone of Richard Jarvis in the UK. It will play a very important role in the future business areas of mobile commerce (M-Commerce). SMS's security has become a major concern for business organizations and customers.

Many people send delicate information and conduct private conversations via text with little protection from third parties who might intercept the message (SMS) or the storage of their information in phone company records but this is not case for soldiers .The message (SMS) communication between soldiers in order to fill this void and offer soldiers a more securely private means of textual communication, Smart Message Communication for Warrior Using Android is developed.

We used ECC cryptosystem for encryption and decryption of message (SMS). Text Encryption will be a third-party application capable of running on any Android system. It will allow users to send and receive encrypted text messages using our application. About key exchange we used Diffie Hellman key exchange mechanism it'll allow automatically exchange key between soldiers and start a secure session. In this way, we hope to provide a safe and secure means of transferring private messages between any two Android phones and it'll also provide identifying end user as a valid user or not.

Keywords: *Android, Decryption, Encryption, ECC, SMS, Text secure, Cryptosystem.*

I. INTRODUCTION

Messaging (SMS) is getting more popular now-a- days. It will play a very important role in the mobile messa mobile commerce [3] (M-Commerce). Up to now many business organizations use SMS for their business purposes. SMS's security has become a major concern for business organizations and customers. There is a need for an end to end SMS Encryption in order to provide a secure medium for communication. Security is main concern for any business company such as banks who will provide these mobile banking services. Currently there is no such scheme that provides complete SMSs security. The mobile messaging market is growing rapidly and is a very profitable business for mobile operators. It can be seen from figure1 that the growth rate of SMS in worldwide during 2000 – 2015F (F stands for forecast) in billion.SMS has a variety of advantages and disadvantages for M-Commerce purpose [3]. The advantages are easy to use, common messaging tool among consumers, works across all wireless operators, affordable for mobile users, no specific software required to installation, allows banks and financial institutions to provide real-time information to consumers & employees, stored messages can be accessed without a network connection.

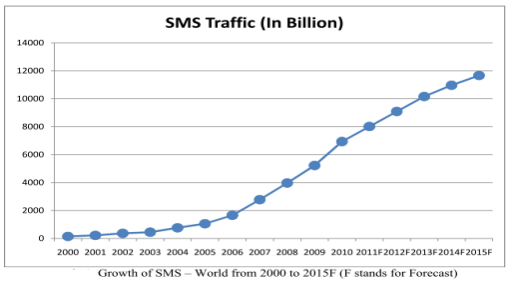

Fig. 1: SMS Traffic

Very few disadvantages are text data and limited up to 140-160 characters per message, does not offer a secure environment for confidential data during transmission and there is no standard procedure to certify the SMS sender. Presently researchers proposed some security concepts regarding SMS security. Most of the proposals are software frames to be installed on mobile device and /or on the SIM cards to implement security [4].

Two are the major security vulnerabilities affecting SMS [1] based communication: the lack of confidentiality during the transmission of a message and the absence of a standard way to certify the identity of the user (or at least his phone number) who sent the message.

This project regarding to exchange message in secure manner at peer level. It has a software framework to enable user to transfer message in secure manner using ECC [5] and security parameters for transmitting secure message to achieve better cost and efficiency of the operation.

This represented in external architecture of project as shown in figure 2.

The remaining part of the paper is organized as follows: Section II gives a view about secure messaging, Section III describes the System Architecture, Section IV describes the Implementation details, and finally Section V gives the conclusion and future work.

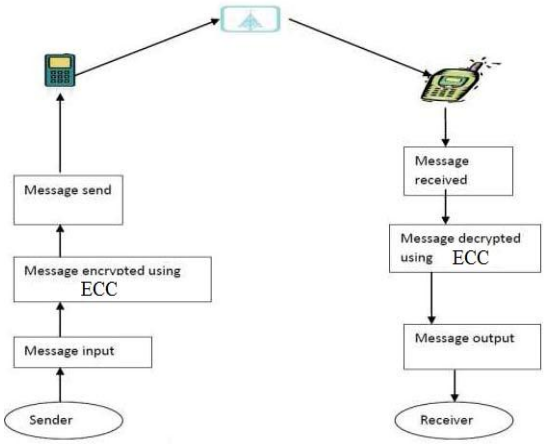

Fig. 2: External architecture

II. SECURE MESSAGING

Project is based on non-server architecture mobile communications; security solutions are implementable for individuals due to its independency from the mobile phone network operator or service provider. Thus, the user does not need to make any agreement with the mobile phone network operator or service provider and use of ECC cryptosystem [4] through a non-server based architecture makes better choice to easily experiment. As a result, all the cryptographic operations are achieved on the user's mobile phone. Terms of overhead cost of communication is less than server architecture system, due to discard in the communication between the user and the server

Secure messaging will be a third-party application capable of running on any Android system. It will allow users to send and receive encrypted text messages using the standard SMS [10] text messaging system and will only sends encrypted data over that system. Without the secure SMS program and an appropriate key/password, any intercepted or stored messages will appear unreadable. In this way, we hope to provide a safe and secure means of transferring private messages between any two Android phones.

III. SYSTEM ARCHITECTURE

The SMS system is a service provided by mobile network company. Our main motto is implementing a security[4] at application level this process contains 4 fundamental elements sender, receiver, encryptor and decryptor which are shown in figure 3.

Sender: The sender using "Secure Message Communication for Battlefield Soldiers Using Android" application allowed to enter passphrase for generating a local key value .After generating key value sender can establish a secure session with other device .This secure session indicates a encrypted SMS transfer between sender and receiver.

Receiver: As soon as message arrived from sender to receiver, receiver is intimated by a notification message indicating that key exchange and processing of key is completed and secure session can start now. Both at sender and receiver encryption (while sending) and decryption (while receiving) occurs automatically.

Encryptor and Decryptor: This takes a text message entered by user and key which is exchanged between two parties before session begins. Encryptor module automatically encrypts SMS and sends that to receiver. Sender also nowhere aware about cipher pattern. Whereas decyptor takes a cipher text which is received from SMS System and takes key which is exchanged before secure session established. As soon as cipher SMS is received from sender , the decryptor module converts that into plane text and displays in device screen.

SMS System: This is built in mobile network where it performs a store forwarding of message to or from end users.

Shared key: This key is generated at both end automatically by using a local key pairs generated in communicating parties. This generated local key pairs are exchanged by using Diffi Hellman key exchange algorithm.

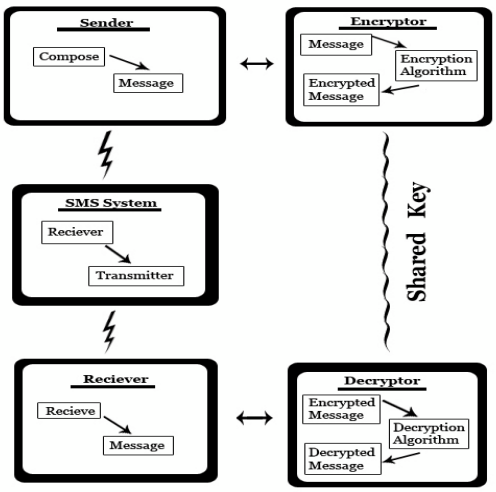

Fig. 3: System architecture

IV. IMPLEMENTATION

Secure message application developed using Android JAVA and which uses crypto packages from java library. The implementation includes dividing complete project into four modules they are sender, receiver, encryption and decryption modules and GUI for sender is such that sender is allowed to enter receiver mobile number, raw key and message which is to be transmitted while at receiver end, receiver is allowed to enter same raw key to decrypt and read. The coding keeps users away from the internal key generation and encryption/decryption part this makes project simple and efficient.

V. RESULTS

Transferring a encrypted messages in a secure session with a less delay by automatic encrypting and decrypting the message before transmission begins and also identifying a man in middle attack. There will be dialog which accepts passphrase value from Soldiers to generate local encryption key. Then we get toast message showing a generation of encryption key pair. Then we get dialog showing establishment of secure session with particular soldier. Then we get automatic key exchange message between two parties. This indicates a secure session is established. Then we get dialog showing identification of session. This feature helps to identify man in middle attack. Finally we get menu options i.e. verify recipients identity, verify secure session and aborting session.

REFERENCES

[1] Ahmed MA, Kiah MLM, Zaidan BB, Zaidan AA. "A Novel on Linux for Android Mobile Devices". J. Appl. Sci., 10(1): 59-6

[2] Lisonek, David, Drahansky, Martin. "SMS Encryption for Mobile Commerce", Security Technology, International Conference, 2008, doi:10.1109/SecTech.2008.48.

[3] R Agoyi Mary, Seral Devrim. "SMS Security in GSM[4]: An Asymmetric Encryption Approach", 6th International Conference, 2010, pp. 448-452, doi: 10.1109/ICWMC.2010.87.

[4] J. Hoffstein, J. Pipher, J. H. Silverman, "AES: Cryptosystem", Algorithmic Number Theory (ANTS III), Portland,266-278.

[5] Alam GM, Kiah MLM, Zaidan BB, Zaidan AA, Alanazi HO ,"Usingthe features of mosaic image and AES[20] cryptosystem to implement an extremely high rate and high secure data hidden: Analytical study" Sci. Res. Essays, 5(21): 3254- 3260.

[6] Alanizi HO, Kiah MLM, Zaidan BB, Zaidan AA, Zaidan Alam GM . "Security Using AES for Electronic Record Transmissions." Int. J. Pharmacol., 6(6):54-958. Barkan E.

[7] W Balitanas M, Robles RJ, Kim N, Kim T, (2009). "Mobile Communication in Server and Non- Server Mode." Proceedings of BLISS 2009, Edinburgh, GB,IEEE CS.

[8] Challa N, Pradhan J ." Performance Analysis of Public key Cryptographic Systems RSA and AES-128 BIT". IJCSNS Int. J. Comput. Sci. Netw. Security, 7: 87-96. Al-Bakri et al. 93.

[9] Hassinen M, Markovski S (2003)." Secure SMS messaging using Quasi encryption and Java SMS API". Google-developed Java API In: SPLST'03, Finland.

[10] Hassinen M (2006). "Java based Public Key Infrastructure for SMS Messaging" Inf. Commun. Technol., ICTTA'06. 2(1). Hermans, J, Vercauteren F, Preneel B (2010). Speed records for AES-128 BIT. Topics Cryptol., CT-RSA: 73-88.

Performance Optimization of Routing Protocols in Mobile Ad hoc Networks: Issues and Challenges

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Abstract:

Ad hoc networks consist of autonomous self-organized nodes. Nodes use a wireless medium for communication. Thus two nodes can communicate directly if and only if they are within each other's transmission radius. In a routing task, a message is sent from a source to a destination node in a given network. Two nodes normally communicate via other nodes in a multi-hop fashion. Swarm intelligence follows the behavior of cooperative ants in order to solve hard static and dynamic optimization problems. Ants leave pheromone trails at nodes or edges which increases the likelihood of other ants to follow these trails. Routing paths are then found dynamically on the fly, using this so called notion of stigmergy. Creating the optimized routing protocol in MANET was first represented by the protocol that selects the shortest path. Later, context-aware metrics were considered to develop and optimize the routing protocols. Prediction, modeling, and AI techniques were also included to support the optimization. Researchers have invented optimum routing protocols with the main goal of their design formulated for particular objectives in the invented protocol. As such, there are already many routing protocols that equate the most suitable path with the shortest, most reliable, or most self-organized path. Also, there are the self-management protocols that are composed of self-protecting, self-healing, self-configuring, and self-optimizing components. Although they have different objectives, each of these protocols reflects their objective. For this reason, the search for the most effective routing protocol that provides the optimum path and satisfies the entirety of objectives still continues, as to our knowledge no routing protocol can handle and solve all these objectives at once, although there are many protocols which can solve one, two, or maybe even three of these objectives. Thus, from the survey undertaken in this paper, it can be expressed that there is a need for an approach that could deploy the existing algorithms based on the network's needs.

Keywords: *Ad hoc Networks, Swarm intelligence, optimization, AI Techniques*

I. INTRODUCTION

The evolution in mobile applications demands extra attention from the researchers working to optimize MANET for better service. The optimization in MANET, however, is more difficult than that of wired networks due to MANET characteristics such as lack of centralization, network mobility, and multi-hop communications. Routing optimization is therefore one of the most important fields in today's MANET development. A survey of various Optimization Techniques for routing in Mobile Ad hoc Networks is carried out. Various classifications for the optimized routing protocols have been presented according to the routing metrics, the prediction techniques, and the use of Artificial Intelligence (AI). An overview of the invented MANET optimized routing protocols based on routing metrics, predictions techniques, and AI techniques are presented below.

II MANET Routing Protocol Optimization

In MANETs, optimization has been used in different wireless layers and in a variety of techniques. The attention of researchers over the last decade, however, has been focused specifically on enhancing the MANET routing protocols. The principle behind optimizing MANET route is to control the flows in the network such that the flows are given better or best-effort treatment. Therefore, the best metrics to represent the success of the optimization process and also measure MANET performance could be increased throughput, reduced packet loss, reduced latency, and reduced load. As such, this paper tends to focus on throughput and delay as the two most important performance metrics for optimization solutions.

A. Optimum Routing Protocols Based on Routing Metrics

Most of the optimization protocols, as in [1], are designed based on traditional or widely implemented protocols. These optimized protocols have been enhanced from the original routing protocols by including some features that perform the optimization. This process converts the traditional routing protocols to an optimization protocol. MANET optimization has been based on routing metrics, such as the traditional hop count metric, and the context-aware metrics, as discussed below.

i) Hop Count Metric

Selecting the optimum path (that with the least cost) according to the hop count metric is one way of optimizing the route. The optimum route relaying on the minimum hop count could be accomplished in different ways, such as: by selecting the shortest path (node by node), as in Al-Khwildi and Al-Raweshidy [2]; by selecting one of many paths discovered through the route discovery process, as in Dai and Wu [3]; or by a unicast query in the route discovery process, as in Seet et al. [4].

ii) Context Aware Metrics

In Ad hoc networks, routing not only has to be fast and efficient, but also adaptive to the changes in the network topology; otherwise, the performance may be severely degraded. As mentioned earlier, route optimization can be accomplished by considering those context-aware metrics which measure MANET performance. Context-aware metrics could include mobility awareness, energy awareness, power awareness, availability, contention awareness, and congestion awareness. Research to find more context-aware metrics that affect the routing process is ongoing. Including such metrics in the invented protocols should help to improve MANET performance. Examples of those context-aware metric(s) that researchers depend upon to create their optimized protocol are listed below:

1. The *energy-aware* metric was represented by two objectives; node's life time and the overall transmission power were the basis for creating the battery-life aware routing schemes for wireless Ad hoc networks in [5]. In that development, the aim was to minimize the overall transmission power requested for each connection and to maximize the lifetime of Ad hoc wireless networks, meaning that the power consumption rate of each mobile host must be evenly distributed. The routing schemes invented by Kim et al. [6] also relied on an energy aware context metric to select the path of least cost and sufficient resources. Furthermore, in the Mukherjee et al. [7] the energy aware metric was the major element in developing an analytical optimized method to minimize routing energy overhead. In the multicast routing field, Moh et al. [8] invented a robust two-tree multicast protocol also based on the energy aware context. This protocol uses two trees, a primary and an alternative backup tree, to improve the energy efficiency and to offer a better energy balance and packet delivery ratio.
2. The *bandwidth-aware* metric was utilized to create the Mukhija and Bose [9] Reactive Routing Protocol.
3. The *congestion-aware* metric was utilized in the Lu et al. paper [10] to establish distance vector routing protocol.

In addition, more than one context-aware metric was combined with the routing metric to achieve a better outcome. Reference [11] introduced the *availability aware* metric that is represented by the quantity relationship of *link status* and *mobility aware*, as the quantity is required to predict the link status for a future time period in consideration of mobility. Next, *path congestion* and *energy usage* metrics were combined with the *hop count* metric in the Cao and Dahlberg protocol [12] to represent the cost criteria that defines path cost during *Route discovery*.

Moreover, the routing schemes developed by Chen and Nahrstedt [13] select the network path with the least cost and sufficient resources to satisfy a certain delay and bandwidth requirement in a dynamic mobile environment. This protocol combines hop *count* with *energy, latency, and bandwidth-aware* metrics. Additionally, *energy-aware* and *congestion-aware* metrics were both included in the mobile routing approach of Ivascu et al. [14].

Usually, the ZRP is configured for a particular network through an adjustment of a single parameter: the routing zone radius. Paper [15] combines *mobility-*, *contention-*, and *congestion-aware* metrics to address the issue of configuring the ZRP and providing the best performance for a particular network, at any time. Finally, other combinations were also possible, such as *power-aware* and *mobility-aware* metrics for mobile Personal Area Network in Park et al. [16]. This optimization technique includes context-aware metrics with routing metrics that would be effective when activated or employed in an online or real scenario.

B. Optimum Routing Protocols Based on Prediction

While the previous optimization technique based on routing metrics can be considered as one type of optimizing, another optimization type is the predication technique. Optimizing routing metrics based on prediction is utilized in networking to achieve a better outcome. Prediction yields an initial idea about the behaviour of network elements. In the study by Jiang et al. [17], an equation was formulated to predict the link status for a time period in the future for a *mobility aware* quantity, whereas Ghosh et al. [18] predicted the user movement based on GPS receivers to control a hub-based orbital pattern in the Sociological Orbit aware Location Approximation and Routing (SOLAR) protocol.

C. Optimum Routing Protocols Based on Modeling /Prediction Techniques

Modeling is another optimization technique which is also included in this paper. The modeling process in MANET is utilized to support the prediction technique, as it includes the estimation of various performance metrics for the multi-hop wireless networks; for example, the empirical model in [19] developed to characterize the relationship between the proposed response indexes, according to influential factors. The four response indexes were packet delivery ratio, end-to-end delay, routing overhead, and jitter. The influential factors were node mobility, offered load, network size, and routing protocol.

A mathematical framework to model *contention* was presented by Jindal and Psounis [20]. This framework was used to analyze *any* routing scheme, with *any* mobility and channel model. This framework can also compute the expected delays for different representative mobility-assisted routing schemes under random direction, random waypoint, and community-based mobility models. This framework could be considered *mobility model aware* as it investigated three different mobility models [21] to conclude the delay. The delay expressions were then used to optimize the design of routing schemes. Additionally, in the bi-objective linear programming mathematical area, Guerriero et al. [22] proposed a bacterium optimization model which allows the *energy* consumption and the *link stability* of mobile nodes to be taken into account, simultaneously. Prediction based on modeling is an interesting area in optimization. This technique was employed by Nogueira et al. [23] to create a framework to model MANET. The framework integrates important functional characteristics such as traffic flow, mobility, and background traffic, with each characteristic represented by its own matrix. The mathematical network model was built from a set of (past) traffic measurements and the corresponding network performance metrics. This constructed model can then be used to predict future values of the network metrics, depending on the mathematical cost function, and based only on the network gateway's traffic measurements parameters.

D. Optimum Routing Protocols Based on Application Requirements

Prediction based on MANET application requirements is a very important issue that could be considered as another type of optimization in MANET. The Cross-layer Route Discovery Framework (CRDF) [24] proposes Routing Strategy Automation (RoSAuto) technique that enables wherein each source node automatically decides the routing strategy based on the application requirements, and then each intermediate node further adapts the routing strategy so that the network resource usage can be optimized. In addition, CRDF was designed to provide a flexible architecture for searching desirable routes with low control overhead. CRDF relies on the Priority-based Route Discovery Strategy (PRDS) mechanism to solve the "next-hop racing" problem and the "rebroadcast redundancy" problem.

E. Optimum Routing Protocols Based on Programmable Framework

Prediction based on a programmable platform is another type of optimization in MANET. Papers [25], [26], and [27] present a context-based programmable framework and functionality for dynamic service/protocol deployment. This technique allows the nodes of a MANET to download and safely activate the required service/protocol software dynamically. According to the available contextual information, the nodes will evaluate the preconditions that will trigger the downloading and activation. This strategy leads to the arrangement of the nodes' capabilities so that common services and protocols can be deployed even if the downloading and activation are not available at every node. In addition, dynamic context-driven deployment may lead to a degree of network self-optimization.

F. Optimum Routing Protocols Based on Artificial Intelligence

Evolving Artificial Intelligence (AI) has played a key role in optimization. There are a variety of optimization techniques to solve MANET routing problems in AI standard repertoire, examples of which are given below.

a) Neural Network Approach

Guo and Malakooti [28] present a solution for optimizing the route through employing intelligent use of the nodes' past experiences of the network traffic conditions in order to make predictions for future network traffic conditions based on these experiences. Furthermore, Guo and Malakooti developed a neural network to predict the mean per-packet one-hop delays. The nodes then used the predicted one-hop delays to participate in dissemination of routing information.

b) Neuro Fuzzy Approach

Martinez-Alfaro and Hernandez-Vazquez [29] used an Adaptive Neuro-fuzzy Inference System (ANFIS) as a predictor. ANFIS is employed inside an Ad hoc hierarchical network to resolve the route error optimization problem. The principal problem to resolve was how many nodes the routing protocol can accept? Given that, the larger the network size, the more performance will suffer. In this Ad hoc hierarchical network, ANFIS predicts future node mobility to keep the network working at the same level irrespective of how many nodes join the network.

c) Swarm Intelligence Approach

Many routing protocols draw inspiration from Swarm Intelligence similar to the ant colony adaptive routing algorithm of Caro et al. [30]. In their study, the authors presented the algorithm as a robust, decentralized, and self-organised method of routing. Moreover, Huang et al. [31] investigated a multicast routing protocol which strived to meet the variation of network topology behaviour (scalability), and satisfy the requirements of specific multimedia traffic, utilising Particle Swam Optimisation (PSO) in volatile MANET environments. In the sensors network, Shih [32] evolved PSO to create an *energy aware* cluster-based routing protocol that exploits the geographical location information of nodes to assist in network clustering. Also, in the same Ad hoc sensor network area based on Swarm Intelligence, a robust *mobility aware* and *energy aware* SIMPLE routing protocol [33] was the solution suggested by Yang et al. for the data acquisition problem found in those networks with mobile sinks.

Furthermore, Rajagopalan and Shen [34] used the Swarm Intelligence mechanisms in Ad hoc networking with Swarm Intelligence (ANSI) to produce a *congestion aware* ANSI routing protocol to select next-hops for both pure and hybrid Ad Hoc networks. Finally, based on the Swarm Intelligence mechanism, Shen and Rajagopalan [35] created an adaptive Protocol-Independent Packet Delivery Improvement Service (PIDIS) mechanism to recover lost multicast packets. The advantage of this mechanism is that the operations of PIDIS do not rely on any underlying routing protocol and can be incorporated into any Ad hoc multicast routing protocol.

III. RELATED WORKS

i) Models

As seen previously, a mathematical equation was utilized in MANET to create models such as those of Jindal and Psounis [20], Guerriero et al. [22], and Nogueira et al. [23]. Also relevant is an attempt by Martinez-Alfaro and Hernandez-Vazquez [29] to utilize AI modeling techniques to solve MANET routing problems. The work in [23] creates MANET mathematical models. The work in [20] and [22] have created models for parameters in the network, whereas this paper represents the network performance against context parameters.

ii) Prediction

Both works, in [23] and this paper utilized prediction components for optimization. The work in [23] relies on mathematical equations whereas, in this paper routing protocols optimization system utilizes AI by implementing Particle Swarm Optimization.

iii) Design

The main difference between most of the mentioned works and the work in this paper is that previous researchers have proposed new protocols to be added to the numerous existing routing protocols, as each protocol is only useful in a certain network context. However, in this paper no new protocol is suggested; it is a selection approach that deploys the available routing protocols to their best advantage. Second, the work in [20] and [35] on the invented model or mechanism could be applied with any network routing protocol. Both researches are relevant to the re-tuned system in that they are flexible and can be adapted to changes. The Programmable Ad Hoc network (PAN) project [27] has the basic design idea to select routing protocol depending on contextual information. The features of the PAN project are indicated below:

1. The PAN project considers network programmability to solve MANET routing problems.
2. It creates context models utilizing lightweight Unified Modeling Language (UML).

3. The PAN project models represent the network context.
4. The hierarchal network of the PAN project consists of three layers, manger head, cluster head, and cluster node.
5. The PAN project is both *mobility aware* and *scalability aware*, these parameters were implemented in different ways. For the PAN project, the scalability problem is solved by changing the network topology to a hierarchal approach that consists of three layers so that as the number of nodes increases, more clusters are added.
6. The work presented in the PAN project was time discrete; there was no graph presenting one continuous experimental (or simulation) scenario to show the switching of the invented scheme through time or which routing protocol (AODV or OLSR) was adopted for each period. Also, the cluster nodes switching adaptation strategy was not clear.

IV CONCLUSION

Creating the optimized routing protocol in MANET was first represented by the protocol that selects the shortest path. Later, context-aware metrics were considered to develop and optimize the routing protocols. Prediction, modeling, and AI techniques were also included to support the optimization. Researchers have invented optimum routing protocols with the main goal of their design formulated for particular objectives in the invented protocol. As such, there are already many routing protocols that equate the most suitable path with the shortest, most reliable, or most self-organized path. Also, there are the self-management protocols that are composed of self-protecting, self-healing, self-configuring, and self-optimizing components. Although they have different objectives, each of these protocols reflects their objective. For this reason, the search for the most effective routing protocol that provides the optimum path and satisfies the entirety of objectives still continues, as to our knowledge no routing protocol can handle and solve all these objectives at once, although there are many protocols which can solve one, two, or maybe even three of these objectives. Thus, from the survey undertaken in this paper, it can be concluded that there is a need for an approach that could deploy the existing algorithms based on the network's needs.

REFERENCES

[1] S. Jiang, Y. Liu, Y. Jiang, and Q. Yin, "Provisioning of adaptability to variable topologies for routing schemes in MANETs," *IEEE Journal on Selected Areas in Communications*, vol. 22, issue 7, pp. 1347–1356, 2004.

[2] A. N. Al-Khwildi and H. S. Al-Raweshidy, "A proficient path selection for wireless Ad hoc routing protocol," *The 8th International Conference on Advanced Communication Technology, ICACT 2006*, vol.1, pp. 599–604, 2006.

[3] F. Dai and J. Wu, "Proactive route maintenance in wireless Ad hoc networks," *IEEE InternationalConference on Communications, ICC 2005*, vol. 2, pp. 1236–1240, 2005.

[4] B. Seet, B. Lee, and C. Lau, "Optimisation of route discovery for dynamic source routing in mobile Ad hoc networks," *IET Journals, Electronics Letters*, vol. 39, issue 22 , pp. 1606–1607, 2003.

[5] C. K. Toh, H. Cobb, and D. A. Scout, "Performance evaluation of battery-life aware routing schemes for wireless Ad hoc networks," *IEEE International Conference on Communication , ICC 2001*, vol. 9, pp. 2824–2829, 2001.

[6] D. Kim, J. J. Garcia-Luna-Aceves, K. Obraczka, J. Cano, and P. Manzoni, "Routing mechanisms for mobile Ad hoc networks based on the energy drain rate," *IEEE Transactions on Mobile Computing*, vol.2, no. 2, pp.161–173, 2003.

[7] T. Mukherjee, S. K. S. Gupta, and G. Varsamopoulos "Energy optimisation for proactive unicast route maintenance in MANETs under end-to-end reliability requirements," *Performance Evaluation*, vol.66, pp. 141–157, 2009.

[8] S. Moh, C. Yu, B. Lee, and H. Y. Youn, "Energy efficient and robust multicast protocol for mobile ad hoc networks," *Proceedings of the Pacific Rim International Symposium on Dependable Computing*, pp.145–152, 2002.

[9] A. Mukhija and R. Bose, "RRP - A bandwidth-efficient routing protocol for mobile Ad hoc networks," *Proceedings of the 2nd International Information and Telecommunication Technologies Symposium (I2TS 2003)*, Florianopolis, Brazil, 2003.

[10] Y. Lu, W. Wang, Y. Zhong, and B. Bhargava, "Study of distance vector routing protocols for mobile Ad hoc networks," *Proceedings of the First IEEE International Conference on Pervasive Computing and Communications, PerCom 2003*, pp.187–194, 2003.

[11] S. Jiang, Y. Liu, Y. Jiang, and Q. Yin, "Provisioning of adaptability to variable topologies for routing schemes in MANETs," *IEEE Journal on Selected Areas in Communications*, vol. 22, issue 7, pp. 1347–1356, 2004.

[12] L. Cao and T. Dahlberg, "Path cost metrics for multi-hop network routing," *Proceedings of the 25th IEEE International Conference on Performance, Computing, and Communications, IPCCC 2006*, pp.7–22, 2006.

[13] S. Chen and K. Nahrstedt, "Distributed quality-of-service routing in Ad hoc networks," *IEEE Journal on Selected Areas in Communications*, vol.17, no. 8, pp.1488–1505, 1999.

[14] G. I. Ivascu, S. Pierre, and A. Quintero, "QoS routing with traffic distribution in mobile Ad hoc networks," *Computer Communications*, vol. 32, pp. 305–316, 2009.

[15] M. R. Pearlman and Z. J. Haas, "Determining the optimal configuration for the zone routing protocol," *IEEE Journal on Selected Areas in Communications*, vol. 17, issue 8, pp. 1395–1414, 1999.

[16] M. H. Park, C. M. Park, S. H. Kim, S. B. Hong, and J. S. Choi, "A novel routing protocol for Personal Area Network MObility (PANEMO) environment," *Proceedings of the 6th International Conference on Advanced Communication Technology*, vol. 1, pp.11–14, 2004.

[17] S. Jiang, Y. Liu, Y. Jiang, and Q. Yin, "Provisioning of adaptability to variable topologies for routing schemes in MANETs," *IEEE Journal on Selected Areas in Communications*, vol. 22, no. 7, pp.1347–1356,2004.

[18] J. Ghosh, S. J. Philip, and C. Qiao, "Sociological orbit aware location approximation and routing in MANET," *Ad Hoc Networks*, vol. 5, no. 2, pp.189–209, 2007.

[19] I. Ajbar and D. Perkins, "Evaluating mobile Ad hoc networks: A performance index and statistical model," *IEEE Proceedings Conferences of 16th International Conference on Computer Communications and Networks, ICCCN 2007*, pp. 284–290, 2007.

[20] A. Jindal, and K. Psounis, "Contention-aware performance analysis of mobility-assisted routing," *IEEE Transactions on Mobile Computing*, vol. 8, no. 2, pp.145–161, 2009.

[21] T. Camp, J. Boleng, and V. Davies, "A survey of mobility models for Ad hoc network research," *Wireless Communication and Mobile Computing, WCMC, Special issue on Mobile Ad Hoc Networking: Research, Trends and Applications*, vol. 2, no. 5, pp. 483–502, 2002.

[22] F. Guerriero , F. De Rango, S. Marano, and E. Bruno, "A biobjective ptimization model for routing in mobile Ad hoc networks," *Applied Mathematical Modelling* , vol. 33, no. 3, pp.1493–1512, 2009.

[23] A. Nogueira, P. Salvador, and R. Valadas, "Joint modeling of MANET characteristics for QoS prediction," *The 12th IEEE Symposium on Computers and Communications, ISCC 2007*, pp. 429–435,2007.

[24] B. Zhou, A. Marshall, J. Wu, T. H. Lee, and J. Liu, "A cross-layer route discovery framework for mobile Ad hoc networks," *EURASIP Journal on Wireless Communications and Networking*, issue 5, pp. 645–660, 2005.

[25] A. Malatras, G. Pavlou, and S. Sivavakeesar, "A programmable framework for the deployment of services and protocols in mobile Ad hoc networks," *IEEE Transactions on Network and Service Management*,vol. 4 , issue 3, pp.12–24, 2007.

[26] A. Malatras, A. Hadjiantonis, and G. Pavlou, "Exploiting context-awareness for the autonomic management of mobile Ad hoc networks," *Journal of Network and Systems Management*, Springer, vol.15, no. 1, pp. 29–55, 2007.

[27] "Programmable Ad hoc Network (PAN) project," *EPSRC*, Grant Reference: GR/S02129/01, [Online], availableon:http://personal.ee.surrey.ac.uk/Personal/G.Pavlou/projects/PAN,

[28] Z. Guo and B. Malakooti, "Delay prediction for intelligent routing in wireless networks using neural networks," *Proceedings of the 2006 IEEE International Conference on Networking, Sensing and Control, ICNSC '06*, pp. 625–630, 2006.

[29] H. Martinez-Alfaro and M. A. Hernandez-Vazquez, "DSR protocol scalability optimization in mobile Ad hoc networks with ANFIS," *IEEE International Conference on Systems, Man and Cybernetics*, vol. 4, pp. 3414–3419, 2003.

[30] G. Di Caro, F. Ducatelle, and L. M. Gambardella, "Swarm Intelligence for routing in mobile ad hoc networks," *In Proceedings of the 2005 IEEE Swarm Intelligence Symposium, SIS 2005*, pp. 76–83, 2005.

[31] C. Huang, Y. Chuang, and K. Hu, "Using particle swam optimization for QoS in Ad hoc multicast," *Engineering Applications of Artificial Intelligence*, vol. 22, issue 8, pp. 1188–1193, 2009.

[32] T. Shih, "Particle swarm optimization algorithm for energy-efficient cluster-based sensor networks," *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences*, vol.E89–A, no.7, pp.1950–1958, 2006.

[33] H. Yang, F. Ye, and B. Sikdar, "A swarm-intelligence-based protocol for data acquisition in networks with mobile sinks," *IEEE Transactions on Mobile Computing*, vol. 7, issue 8, pp. 931–945,2008.

[34] S. Rajagopalan and C. Shen, "ANSI: A swarm intelligence-based unicast routing protocol for hybrid ad hoc networks," *Journal of Systems Architecture*, vol. 52, issue 8, pp. 485–504, 2006.

[35] C. Shen and S. Rajagopalan, "Protocol-independent multicast packet delivery improvement service for mobile Ad hoc networks," *Ad Hoc Networks*, vol. 5, issue 2, pp. 210–227, 2007.

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Comparison Of UPS Inverter Using PI Controller And NN Controller

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***Abstract*:**
Uninterruptible power supplies (UPSes) are used to provide backup power to critical loads, where even a temporary power failure causes large economic losses. The UPSes are used in applications like computer installations, process control in chemical plants, and general communication systems. The function of UPS is to provide a high quality sinusoidal voltage and for this it needs to be controlled. Conventional controllers cannot provide the exact sinusoidal output with the nonlinear loads. The artificial neural network controller having an advantage of adaptability to all loads. The neural network controller is built and trained by using patterns obtained from a simulated controller with multiple feedback loops having an idealized load-current reference. The weights and biases are downloaded to neural network controller and then it is used for online control of inverter. This is to achieve low total harmonic distortion and pure sinusoidal output.

This project proposes the Matlab / Simulink implementation of artificial neural network control of UPS inverter. The type of neural network controller used for UPS inverter is of feed forward type and training algorithm used is back propagation. The training of neural network is made with the help of Matlab NN toolbox. The closed loop simulation results obtained from the neural network controller is compared with PI controller.

Index Terms— Neural network control, UPS inverter.

I. INTRODUCTION:

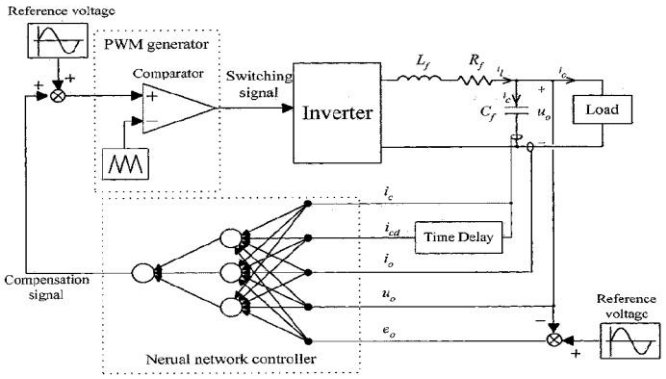
Uninterruptible power supplies are emergency power sources, which have wide spread applications in critical equipments, such as computers, automated process controllers, and in hospital instruments. With the rapid growth in high-efficiency power converters, more and more electrical loads are non-linear and generate harmonics. It is big challenge for a UPS to maintain a high quality sinusoidal output voltage under non-linear loading condition. The high quality sinusoidal output voltage is usually achieved by employing a combination of pulse width modulation (PWM) scheme and a second order filter at the output of the inverter.

A multiple feedback-loop control scheme can be utilized to achieve good dynamic response and low total harmonic distortion. The control scheme is based on sensing the current in the capacitor of the output filter, using it in an inner feedback loop. When the loads are nonlinear, the performance degrades, since such a scheme is developed from a linear system theory.

Neural networks (NNs), it is an interconnection of a number of artificial neurons that simulates a biological brain system. It has the ability to approximate an arbitrary function mapping and can achieve a higher degree of fault tolerance, and successfully introduced in to power electronics. When an NN is used in system control, the NN can be trained either on-line or off-line. In on-line training, since the weights and biases of the NN are adaptively modified during control process, it has better adaptability to non-linear operating condition. The most popular training algorithm for a neural network is back-propagation. It is attractive because it is stable, robust, and efficient. However the back propagation involves a great deal of multiplication and derivation.

Fig. 1 Proposed NN control scheme for a UPS inverter

Parameter	Value	Unit
Switching frequency, f_s	20	kHz
DC source voltage, V_{dc}	48	V
Rated Output Voltage	25	V_{rms}
Rated Output Frequency	50	Hz
Rated Output Current	5	A_{rms}
Rated output impedance	5	Ω
Filter Inductor, L_f	250	μH
Inductor Resistance, R_f	0.2	Ω
Filter Capacitor, C_f	30	μF



The training of a neural network requires a large number of example patterns. These patterns may be obtained from a simulated controller. Although the weights and biases are fixed during the control process, the neural network is a nonlinear system that has much robustness than a linear system. Moreover the forward calculation of neural network involves only addition, multiplication and sigmoid-function of wave shaping. Example patterns are obtained from a simulated controller, which has an idealized load-current reference. After training, the neural network architecture is used to control the UPS inverter in on-line.

The objective of this project is to control inverter output voltage by maintaining it as a high quality sinusoidal shaping in nature with low total harmonic distortion (THD) for UPS applications. This is to be accomplished by an artificial neural network Controller in closed loop further the performance of the UPS inverter with neural network controller is to be compared with PI controller.

II. CLOSED LOOP CONTROL OF UPS INVERTER WITH CONVENTIONAL CONTROLLER

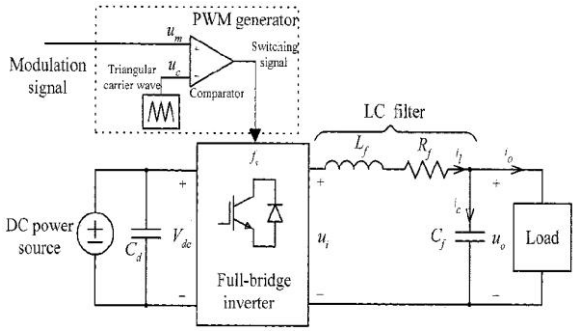


Fig.2

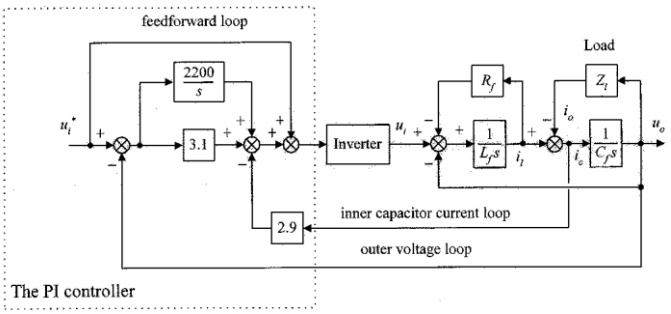


Fig3 Analog PI controller for comparison purpose

The core circuit of the UPS system is the inverter circuit, which is required for power conversion from dc (battery) to ac power. Inverter circuits can be broadly classified into two types,

- ✓ Voltage source inverters(VSI) and
- ✓ Current source inverters (CSI).

A voltage source inverter is one in which the dc source has small or negligible impedance, in other words a voltage source inverter has stiff dc voltage source at its input terminals and constant output voltage at its output. Current source inverter is fed with adjustable current from a dc source of high impedance, i.e. from a stiff dc current source. In a CSI fed with stiff current source, output current wave forms are not affected by load. In voltage source inverters, the input voltage is maintained constant and the output voltage does not depend on the load. However, the waveform of load current as well as magnitude depends upon the nature of the load impedance. In CSI the magnitude of output voltage and its waveform is dependent upon the nature of load impedance. As the UPS systems are mainly known as emergency power sources, they have to produce a constant voltage for that application, which is not furnished by current source inverters. In general all the UPS systems are implemented with voltage source inverters as they can produce the constant output voltage, independent of load.

A multiple feedback loop control scheme is employed in order to have better steady state stability and to achieve good dynamic response. The two loops are outer voltage loop and inner current loop.

The inner current loop provides an inherent peak current limit in the power circuit; in addition, since the capacitor current represents the change of load voltage, the control scheme is capable of predicting near future variations in the load voltage and thus providing a good dynamic response. Further more the outer voltage loop regulates the load voltage and produces a stiff ac voltage supply and ensures a sinusoidal load voltage within the acceptable total harmonic distortion (THD).

In order to reduce the steady state error between the capacitor voltage and its reference waveform a proportional plus integral

(PI) controller is used in fed forward path of outer voltage loop and is designed for resistive load.

III. NEURAL NETWORK CONTROL OF UPS INVERTER

The neural network is an interconnection of artificial neurons. Artificial neural network is a nonlinear network, and has better robustness than linear system, improves the system performance for both the linear and nonlinear type of loads. The many capabilities of neural networks, such as nonlinear functional approximation, learning, generalization, etc are in fact performed due to the nonlinear activation functions of each neuron. The type of activation functions used in neural network control of UPS inverter and back propagation algorithm for training, closed loop control of neural network based UPS inverter is described here

Artificial Neuron

Neural networks are simplified models of the biological nervous systems and therefore have drawn motivation from the kind of computing performed by a brain. An artificial neural network is highly interconnected network of larger number of processing elements called neurons. The basic neuron structure is as shown in figure 3

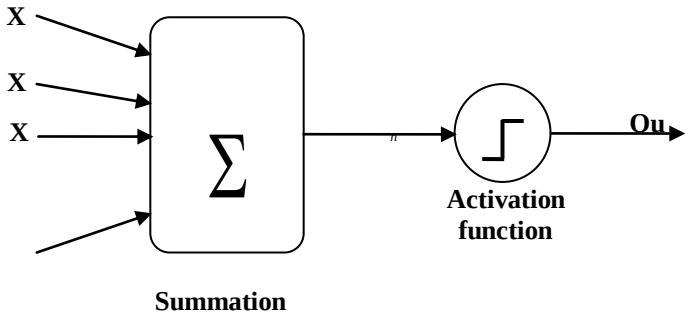


Fig.4 Simple model of artificial neuron

Three basic elements of the neuron model are:

1) A set of connecting links which fetch the input signals to the summation unit. Each of this connecting links is characterized by a weight or strength of its own. The weight of neuron may lie in the range that includes negative as well as positive values.
2) A summation unit or adder, for summing the input signals, weighted by the respective strength of neuron.
3) The last is an activation function for limiting the amplitude of the output of a neuron. The activation function is also referred as squashing function.

As shown in the figure 3, it consists of an input vector, is given by $[X_i]$,

$$[X_i]=[x_1,x_2,x_3,\ldots\ldots\ldots x_n],$$

the number inputs applied to a neuron, the Weights associated with these inputs are represented by a weight vector $[W_i]$.

$$[W_i]= [w_1,w_2,w_3,\ldots\ldots\ldots w_n].$$

The summation block, correspondingly the biological cell body, adds all the weighted inputs algebraically producing an output called as NET. This may be compactly stated in vector notation as follows

$$\mathbf{NET}= \sum_{i=1}^{n} \mathbf{XiW_i}$$

Feed Forward Back Propagation

These are the networks wherein for every input vector laid on the network, an output vector is calculated and this can be read from the output neurons. There is no feed back. Hence only a forward flow of information is present. Networks having this structure are called as **feed forward networks**.

Back propagation is a systematic method for training multilayer artificial neural networks. It's a multi layer forward network using extend gradient descent based delta –learning rule, commonly known as back propagation, it is trained by supervised learning method.

Training of a network by back propagation involves three stages.

The feed forward of the input training pattern, the back propagation of the associated error, and the adjustment of weights. For training, the hidden layers uses *sigmoid* activation and output layer uses *Purelin* activation functions.

Structure of the Neural Network controller

The distortions in the output voltage of UPS inverters are eliminated by using a neural network in closed loop control. The training of neural network is adopted to ensure that the inverter will have a fast transient response. The structure is shown in figure 6

A neural network controller is realized with a large number of samples of various loading conditions, and training of neural network controller is done properly to learn the control law from the patterns, each time a new set of samples is taken for a change in load.

The neural network shown in figure is a multilayer artificial neural network, comprises of an input layer, output layer and hidden (intermediate) layer of neurons. The multilayered neural Networks provide an increase in computational power over a single layer neural network as there is a nonlinear activation function between the layers.

Obtaining example patterns under linear loading conditions

Under the linear load conditions multiple- feedback-loop control scheme gives better results and is shown in figure. The neural network samples are obtained from a simulated controller shown in figure 6, and these samples are used for the training of a neural network controller. The inner current loop in multiple feedback loop control scheme is changed to a load current loop. A sinusoidal voltage reference is fed to the load model to generate an idealized load –current-reference, Io^*.The error between this current reference and actual load current, Io, is used as the input of the controller.

From the figure 6 a fixed set of controller parameters will not work for all types of loads. Each load is associated with a set of optimal parameters which can be determined from simulations that produce an output voltage with low total harmonic distortion (THD) and a small steady state error. A new example pattern is obtained each time the load model is changed.

The modulation signal to the PWM generator consists of two components, one is sinusoidal feed forward signal, and the other is a compensation signal. So, here the neural network is trained to generate only the compensation signal as its desired output. The inputs to the Neural network controller are filter capacitor current, delayed capacitor current, output current, output voltage and the error between actual and reference voltages. The delay of capacitor current is one switching period.

The selection of an NN should be as simple as possible so as to speed up the control processes. The training of the neural network uses the back propagation algorithm and each time the weights and biases are updated to make the mean square error between the desired output and the actual NN output to an acceptable value. The neural network for this is 5-3-1 structure (one hidden layer and one output layer). All the neurons in hidden layer are having same transfer function of sigmoid type and output neuron is having linear type of transfer function. For the training of a neural network the initial weights and biases are randomly chosen between the ranges of -0.5 to 0.5.The neural network is trained with samples for a certain number of iterations so that the mean square error between desired output and actual neural network output is with in an acceptable value.

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IV. SIMULATION RESULTS

We simulate the proposed NN controller and PI controller UPS using Matlab toolbox. The steady-state and transient responses of the proposed NN controlled inverter and PI controlled inverter are investigated. **PI controller based UPS inverter**

The Matlab/Simulink implementation of UPS inverter system is shown in figure 5.1 and the UPS inverter specifications are given in table 5.1. The open loop UPS inverter simulation results are obtained and the output voltage and output current wave forms are shown in figure5.2.From the open loop results it is observed that the total harmonic distortion of the output voltage is 2.68%.The figure 5.3 shows the UPS inverter output voltage and current with load changes from no-load to full load.

The Matlab/Simulink implementation of closed loop control of UPS inverter with PI controller is shown in figure 5.4 with k_p=3.1 and K_i=2200.The output voltage and output current waveforms with PI controller is shown in figure 5.5.From the simulation results it is observed that total harmonic distortion of the output voltage is 1.98%.The figure 5.6 shows the PI controller based UPS inverter output voltage and current with load changes from no-load to full-load.

The Matlab/Simulink implementation of closed loop control of UPS inverter with artificial neural network controller is shown in figure 5.7.The neural network specifications are given in the table 5.2.The output voltage and output current waveforms with neural network controller is shown in figure 5.8.From the simulation results it is observed that total harmonic distortion of the output voltage is 1.76%.

The figure 5.9 shows the neural network controller based UPS inverter output voltage and current with load changes from no-load to full-load. It is observed that the dynamic response of the system is improved compared to the conventional PI controller.

The output voltage and load current waveforms of the inverter system for a full resistive load (5ohm) are depicted as below. The figure shows that the proposed NN controlled UPS inverter is capable of producing a good sinusoidal output voltage.

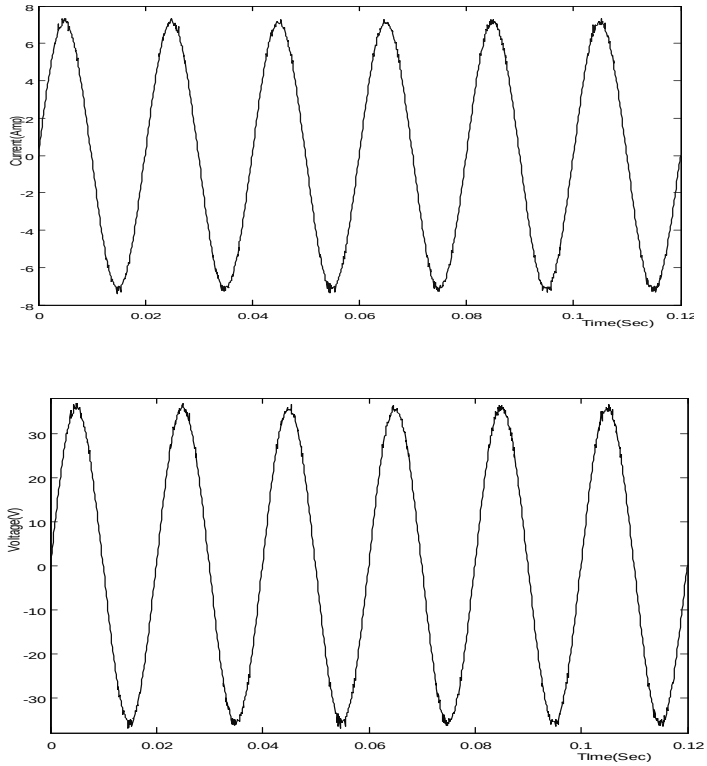

Fig.5 Inverter output current and voltage with PI controller

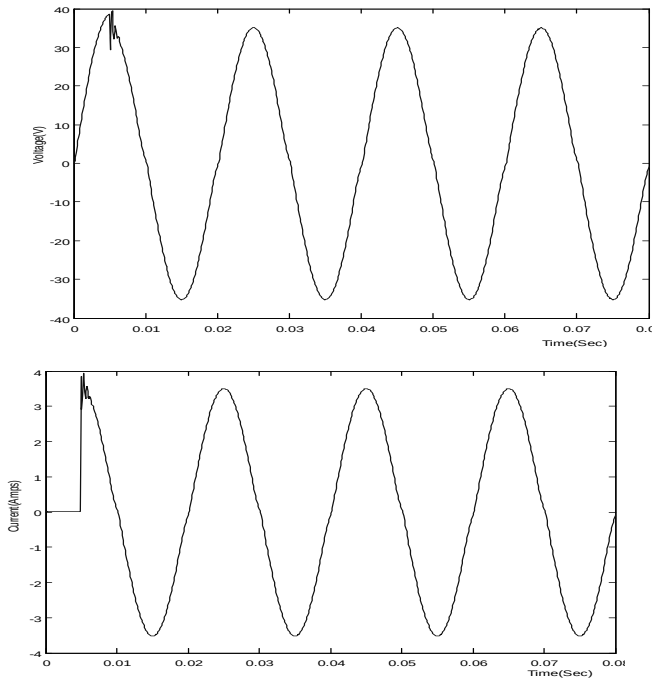

Fig 6 Inverter output voltage and current with change in load from no-load to full load with neural network controller

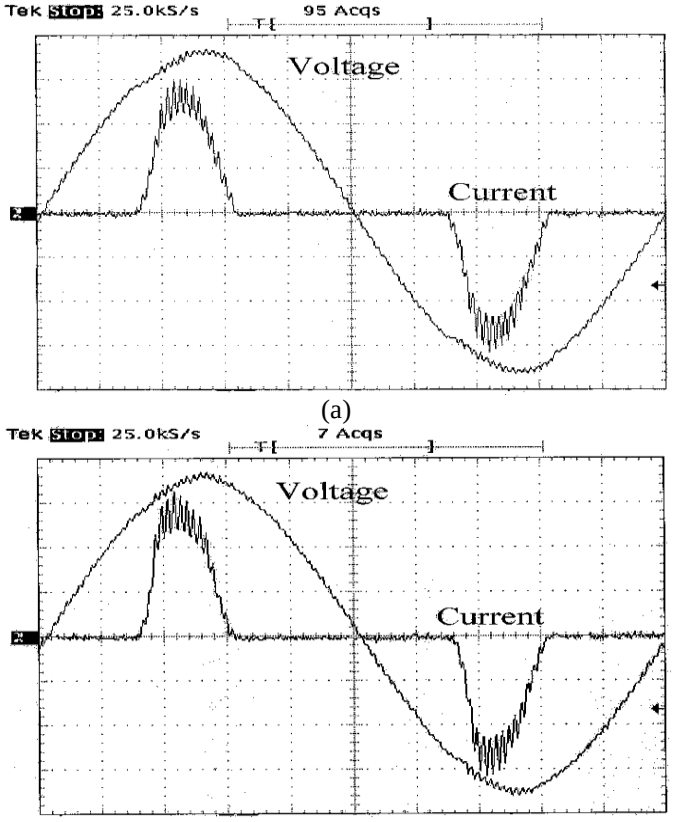

Fig:7 Experimental results forfullwave diode bridge rectifier (3200 _F 10)(a) PI controlled UPS Inverter (b) NN Controlled UPS inverter

Fig. 7 compares the output voltage and load current waveforms of the NN controlled inverter with those of the PI controlled inverter for a full-wave bridge-rectifier load, whose output is connected directly to a 3200 F capacitor in parallel with a 10 resistor.

Fig. 8 compares the THD of the output voltage of the NN controlled inverter with that of the PI controlled inverter under different rectifier-type loads. It is found that the NN controller significantly outperforms the PI controller.

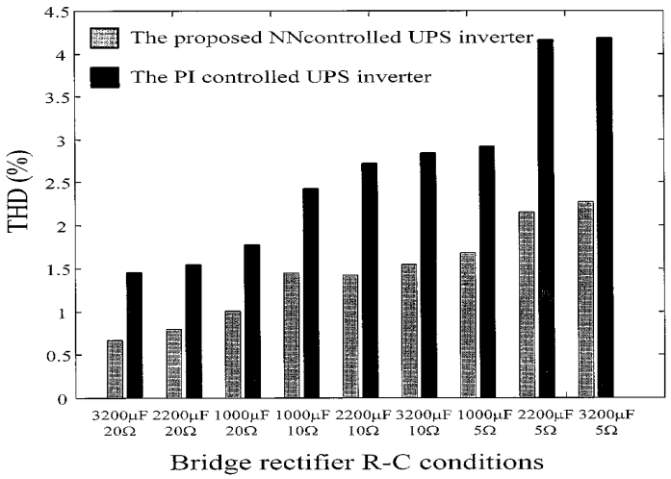

Fig. 8. Comparison of the THD of the output voltage under different rectifier-type loads

CONCLUSIONS

The design and implementation of UPS inverter system with conventional PI controller and artificial neural network controller are developed using Matlab/Simulink toolbox. The open loop and closed loop simulation results of the UPS inverter system with conventional PI controller and artificial neural network controller are obtained, analyzed and compared. From the simulation results it is observed that the artificial neural network controller based UPS inverter system gives less THD in the output voltage and better performance compared to the PI controller.

REFERENCES

[1]. P.D.Ziogas, "Optimum voltage and harmonic control PWM techniques for three-phase static UPS inverters," IEEETrans.Ind,Applicat.vol.IA-16,no.14,pp.542-546,July/Aug 1980.

[2]. N.M.Abdel-Rahim and J.E.Quaicoe, "Analysis and design of a multiple feedback loop control strategy for single phase voltage source UPS inverters," *IEEE Trans.Power Electron*. vol.11, pp, 532-541, July1996.

[3]. M.J.Ryan, W.E.Brumsickle, and R.D.Lorenz, "Control topology options for single phase UPS inverter,"*IEEE Trans.Ind.Applicat*.vol.33,pp,493-501,Mar/Apr.1997.

[4]. B.K.Bose, "Expert systems, fuzzy logic, and neural network applications in power electronics and motion control,"*Proc.IEEE*, vol.82.pp.1083-1112, 1992.

[5]. D.Daniolos,M.K.Darwish,and P.Mehta, "Optimized PWM inverter control using artificial neural networks," Electron Lett.,vol.31,no.20,pp,1739-1740,1995.

[6]. B.R.Lin and R.G.Hoft, "Power electronics inverter control with neural netwoks,"in Proc.IEEE-APEC, 1993, pp.128-134.

[7]. "Introduction to neural networks using matlab 6.0"- S.N Sivanandam,S Sumathi,S.N Deepa,Tata mcgrahill publishers.

[8]. Xiao Sun, Martin H. L. Chow, Member, IEEE, Frank H. F. Leung, Member, IEEE, Dehong Xu, Yousheng Wang, and Yim-Shu Lee, " Analogue Implementation of a Neural Network controller for UPS Inverter Applications."

[9]. Mohammad H.Rashid, "Power Electronics Circuits Devices and Applications," 2nd Edn. Prentice Hall

[10]. "Using MATLAB," The mathworks,Inc.

Ageing Behaviour of Epdm/Pvc Composites

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ABSTRACT

The effect of thermal and weather ageing on observed properties of the EPDM/PVC composites was compared by measuring changes in modulus,tensile strength ,tear strength and elongation at break.The elongation at break and tensile strenght of all samples decreased due to weathering.The morphology of the samples were studied to compliment the observations.The chemical resistance of the samples were also studied in acid and alkali solutions.It can be seen that the 100/10 sample has got the greatest resistance. The results indicate that incorporation of PVC has improved ageing behaviour significantly.

Key words*:* Polymer composites, effect of filler on ageing resistance

I. INTRODUCTION

Many types of thermoplastic elastomers are used in outdoor applications and a common concern of these materials is the durability of the materials in enduse applications[1]. During long periods of service, most of the polymer products gradually lose their properties due to the macromolecular chain degradation. Normally, polymers in the state of their end-use are not pure materials. In many cases there are added substances which alter the engineering and/or chemical properties of the polymer in a useful way. The polymer also may contain small amounts of monomer, entrapped during the polymerization process. Such additives and impurities may participate in the slow chemical degradation of the polymer and, of course, add to the general physical complexity of the polymer. If the polymer is attacked by the environment,the performance of the material in service will be adversely affected.Degardation of the performance of the polymer may lead to premature failure of the material,resulting in increased downtime for the system, and requiring costly maintenance procedures.The study of dimensional stability and mechanical properties of polymeric materi- rials under different environmental conditions such as humidity changes or changes in temperature, solvent, mechanical load, radiation, deserves much importance. This is because materials with superior ageing resistance can be satisfactory durable.

There exist a number of reports on ageing of polymers[2-6]. Harvey Alter examined [7] literature data for the effect of mineral fillers on the mechanical properties of polyethylene at two temperatures, styrene–butadiene rubber, and natural rubber were examined..

The objective of this study is to compare the weather,thermal and solvent resistance of EPDM/PVC cmposites and to compare the properties to those of the control samples.Also accelerated ageing and resistance to chemicals is also investigated.

II. MATERIAL AND METHODS

Ethylene propylene diene monomer (EPDM) [E/P ratio of 62/32 and a diene content of 3.92 % from Herdilla Unimers, New Mumbai]. Poly vinyl chloride (PVC) [from Sigma Aldrich]. The additives such as sulphur,Dicumyl peroxide , zinc oxide, stearic acid, and mercapto benzothiazyl disulphide (MBTS) used were of commercial grade.

The mixing of EPDM with PVC in different ratios was done on a two roll mixing mill Details of formulations are given in Table 1.The samples were compression moulded .

The samples for Field Emission Scanning Electron Microscopy (FESEM) were prepared by cryogenically fracturing them in liquid nitrogen.They were sputter coated with gold and morphology

examination were performed on a scanning electron microscope (JEOL-JS IN-T330-A-SEM; ISS Group, Whittington, Manchester,U.K).

Accelerated ageing of the compression moulded specimens was carried out in an air-circulated ageing oven at 100^{o}C for three days. The ageing characteristics of the samples were studied by measuring the changes in different mechanical properties . The samples were exposed to natural weathering (all environmental effects such as rain, sunlight, wind etc) for a period of 4 months from August 2011 to November 2011.. Samples were collected to study of the effect of weathering. Scanning electron microscopy (SEM) on the surface of specimens before and after the exposure were carried out to study effect of natural weathering on structure and morphology.

The mechanical properties were also investigated. The samples were immersed in organic solvents like toluene, carbon tetra chloride and diesel for 24 hours, dried in an air oven for 24 hours and the mechanical properties determined.

The behavior against weathering conditions was studied by the swelling behavior in different solvents and chemical resistance behavior against acids and bases. Known weight (W_1)of the initial samples were immersed in 100 ml of different solvents and 10 %sodium chloride solution at room temperature for 7 days. The samples were filtered and the excess solvent was removed with the help of filter paper, patted dry with a lint free cloth and then final weight (W_f) was noted. The percent swelling was calculated from the increase in initial weight in the following manner.

$$\text{Percent swelling } (P_s) = \left[\frac{W_f - W_i}{W_i} \right] \times 100$$

For the chemical resistance test, the dried specimens were immersed in 100 ml of 1 N NaOH and 1N HCl for different intervals of time (22-144 hours).After this, the samples were filtered out, dried and weighed. The percent chemical resistance (P_{cr}) was calculated in terms of weight loss in the following manner:

$$\text{Percent chemical resistance } (P_{cr}) = \left[\frac{Wi - W_{aci}}{W_i} \right] \times 100$$

III. RESULTS AND DISCUSSION

Effect of thermal ageing on mechanical properties

Fig. 1 shows the tensile strenght of peroxide cured pure EPDM before and after thermal ageing at 100^{0}C for 3days .Fig. 2 shows the variation in tensile strenght of 100/2.5 EPDM/PVC after thermal aging for the same period.It can be seen that PVC loaded sample has more aging resistance than pure EPDM.

Effect of solvent swelling on mechanical properties

The retention of mechanical properties of the EPDM/PVC composites after immersing the samples in different solvents like aromatic,halogenated hydrocarbon and mixture of aliphatic hydrocarbons for 24 hours are given in the table 2.Among these solvents,the composite exhibits maximum aging resistance in Kerosene .

Swelling coefficient values

Swelling coefficient values of the 100/5 EPDM/PVC composite calculated in different solvents are given in table 3.

Effect of natural weathering on the mechanical properties

The effect of natural exposure of pure EPDM and 100/2.5 EPDM/PVC composite on tensile strenght are given in fig.3.The modulus of the tested samples has changed to a very small extent during the exposure period.The elongation of the composites decreased drastically in all the samples.Also tensile strenght of the composite samples decreased to some extent.

Effect of natural weathering on Morphology

Scanning Electron Micrograph is a reliable tool to monitor the surface changes during degradation of polymers. The presence of highly eroded surface with small cavities in the samples, indicates the higher degradation after 4 months exposure to natural weathering**.** From the SEM pictures in fig. 4, it is clear that the100/7.5 EPDM/PVC and 100/10 EPDM/PVC composites have undergone less degradation than pure EPDM.

Chemical resistance

The percentage chemical resistance (P_{cr}) of EPDM/PVC composites in water, saline water, IN HCl and IN NaOH after 30 days of exposure are given in table 4 and 5.The results indicate that the composite has high resistance toewards water and saline water.Also,the resistance increases with incorporation of PVC due to the chemical resistance of PVC.

IV. CONCLUSION

The effecet of thermal and weather ageing on observed properties of the EPDM/PVC composites was compared by measuring changes in modulus,tensile strenght and elongation at break. The morphology of the samples were studied to compliment the observations.The chemical resistance of the samples were also studied in acid ,alkali ,water and saline water solutions.The results indicate that incorporation of PVC into EPDM matrix can improve aging behaviour significantly.

REFERENCES

[1.] Viveca Lonnberg and Paul Starck.., Comparison of Weather Resistance of Different Thermoplastic Elastomers, *Polym. Test*.**16**, 133-145 **(1997)**

[2.] Ali. M, Emsley A.M., Herman. H. and R.J. Heywood., Spectroscopic studies of the ageing of cellulosic paper. *Polymer* .**42** , 2893-2900 **(2001)**

[3.] Wrobel. G, Stabik.J. and Rojek. .M ., Non-destructive diagnostic methods of polymer matrix composites degradation,*Journal of Achievements in Materials and Manufacturing* Engineering . **31(1)**,53-59**(2008)**

[4.] Struik L.C.E., Physical Aging in Plastic and Other Glassy Materials.*Polymer Engineering and Science*.**17(3)**, 165-173 **(1977)**

[5.] Kallio K.J., Nageye. A.S. and M.S. Hedenqvist., Ageing properties of car fuel-lines; accelerated testing in "close-to-real" service conditions. *Polymer Testing*.**2 (1),** 41-48 (**2010)**

[6.] Yuan Y. C., Yin T, Rong M. Z. and Zhang. M. Q., Self healing in polymers and polymer composites. Concepts, realization and outlook: A review, *eXPRESS Polymer Letters*. **2(4)**, 238-250 ***(2008)***

[7.] Harvey Alter., Filler particle size and mechanical properties of polymers, *Journal of Applied Polymer Science*. **9(4)** , 1525–1531**(1965)**

Table 1 Formulation of Mixes (phr)

Ingredient	Vulcanizing system	
	Sulphur	DCP
EPDM	100	100
PVC(varying amount)	(0,2.5,5,7.5,10)	(0,2.5,5,7.5,10)
Zinc oxide	4	--
Stearic acid	2	--
MBTS	1.5	--
Sulphur(varying amount)	(2,3)	--
Dicumyl peroxide	--	4

Table 2: Percentage retention of mechanical properties of 100/5 EPDM/PVC composite after immersion in solvents for 24 hours

Solvent	Tensile strenght	Young's modulus
Toluene	84	58
Carbon tetra chloride	78	68
Kerosene	55	72

Table 3: Swelling coefficient values of sulphur cured 100/5 EPDM/PVC composite

Solvents	Swelling coefficient
Benzene	1.87
Carbon tetra chloride	2.9999
Diesel	0.0036

Table.4: Percentage chemical resistance of100/5 EPDM/PVC in water

Solvent	Pcr
Saline water	0.013
Water	0.017

Table 5: The percentage chemical resistance of EPDM/PVC composites in IN HCl and IN NaOH

Sample	P_{cr} in (HCl)	P_{cr} in (NaOH)
100/0 EPDM/PVC	0.761	1.393
100/2.5 EPDM/PVC	0.5884	1.617
100/5 EPDM/PVC	0.3180	1.6894
100/7.5 EPDM/PVC	0.3913	1.300
100/10 EPDM/PVC	0.2541	1.276

Caption to Figures:

Figure 1 Tensile strenght of peroxide cured pure EPDM before and after thermal ageing; 1. unaged and 2. Aged

Figure 2 Tensile strenght of peroxide cured PVC loaded EPDM before and after thermal ageing;1.unaged and 2. Aged.

Figure 3 Tensile strenght of sulphur cured EPDM/PVC composite before and after natural weathering;1.unaged pure EPDM , 2. aged EPDM, 3.unaged 100/2.5 EPDM/PVC and 4.aged 100/2.5 EPDM/PVC composites.

Figure 4 SEM pictures of EPDM/PVC before and after natural weathering for four months :

(a) 100/0 EPDM/PVC before ageing
(b) 100/0 EPDM/PVC after ageing
(c) 100/2.5 EPDM/PVC before ageing
(d) 100/2.5 EPDM/PVC after ageing
(e) 100/5 EPDM/PVC before ageing
(f) 100/5 EPDM/PVC after ageing
(g) 100/7.5 EPDM/PVC before ageing
(h) 100/7.5 EPDM/PVC after ageing
(i) 100/10 EPDM/PVC before ageing
(j) 100/10 EPDM/PVC after ageing

Figure 1 Tensile strenght of peroxide cured pure EPDM before and after thermal ageing; 1. unaged and 2. Aged

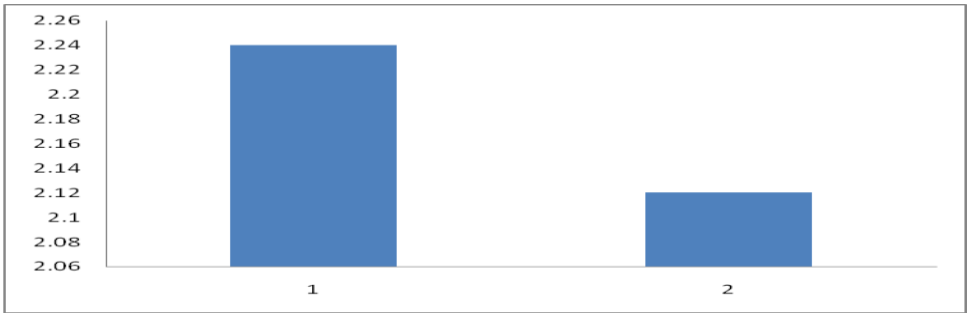


Figure 2 Tensile strenght of peroxide cured PVC loaded EPDM before and after thermal ageing;1.unaged and 2. Aged.

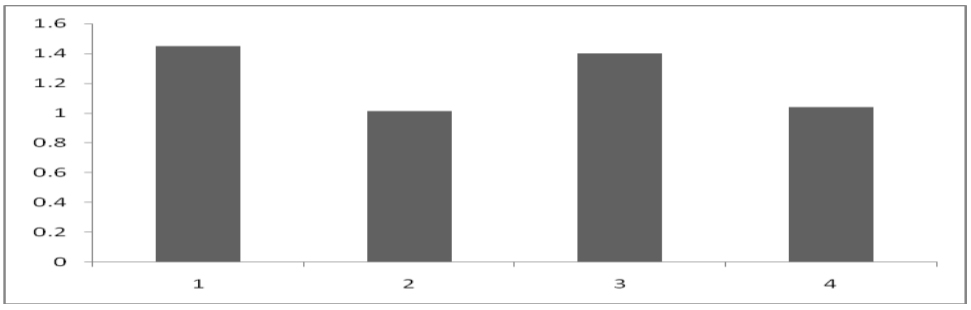
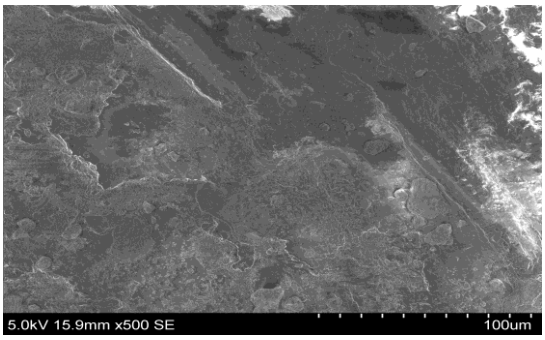
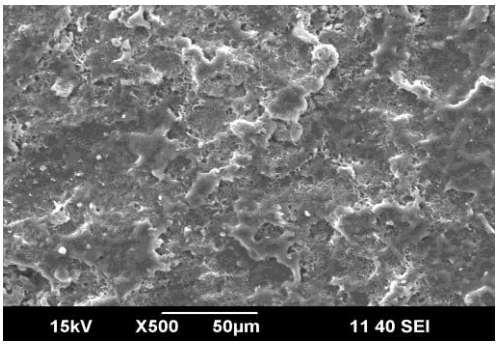


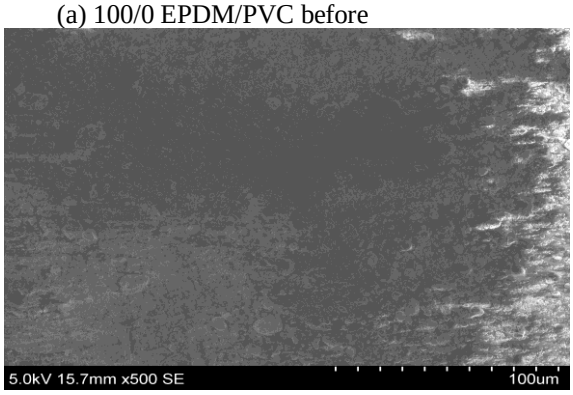
Figure 3 Tensile strenght of sulphur cured EPDM/PVC composite before and after natural weathering;1.unaged pure EPDM , 2. aged EPDM, 3.unaged 100/2.5 EPDM/PVC and 4.aged 100/2.5 EPDM/PVC composites.



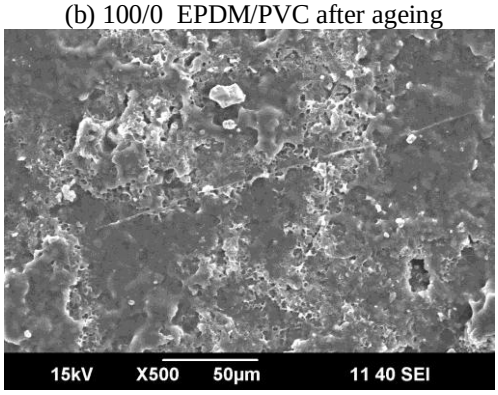
(a) 100/0 EPDM/PVC before



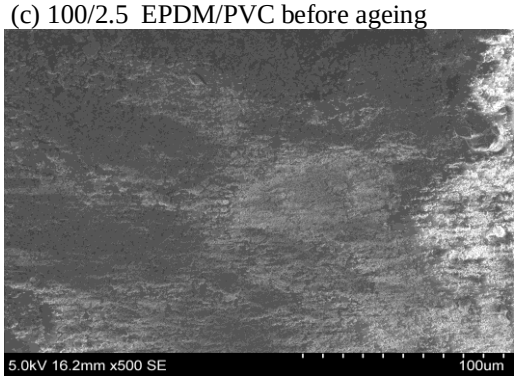
(b) 100/0 EPDM/PVC after ageing



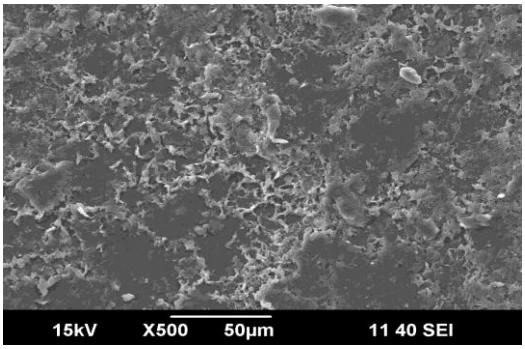
(c) 100/2.5 EPDM/PVC before ageing



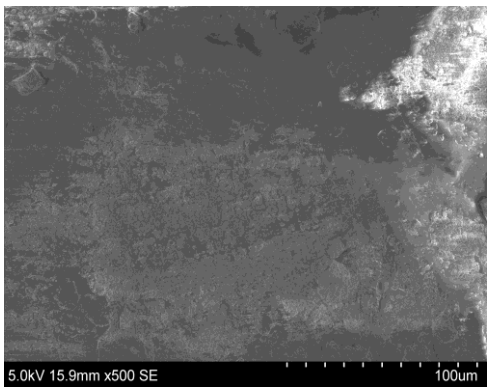
(d) 100/2.5 EPDM/PVC after ageing



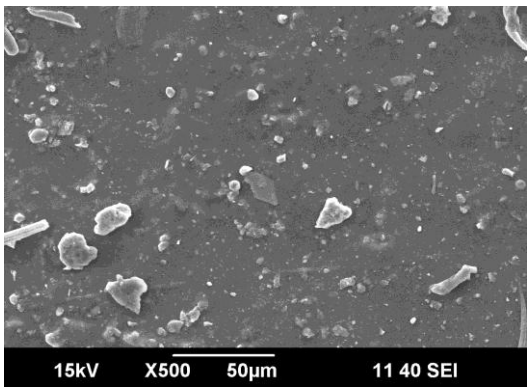
(e) 100/5 EPDM/PVC before ageing



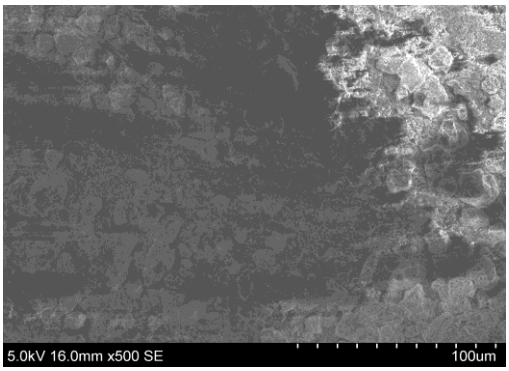
(f) 100/5 EPDM/PVC after ageing

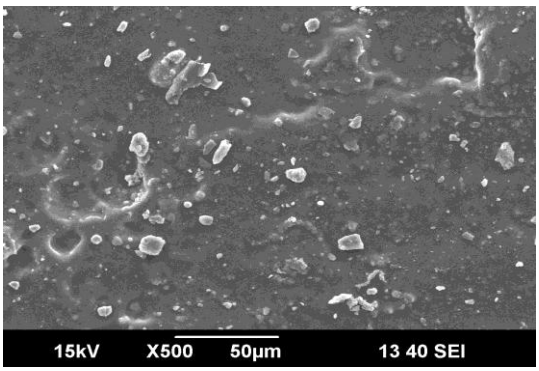


(g) 100/7.5 EPDM/PVC before ageing



(h) 100/7.5 EPDM/PVC after ageing





(i) 100/10 EPDM/PVC before ageing (j) 100/10 EPDM/PVC after ageing

Figure 4 SEM pictures of EPDM/PVC before and after natural weathering for four months:

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On A Locally Finite In Ditopological Texture Space

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ABSTRACT

The present study deals with the new concept namely α- para compactness in ditopological texture spaces. Also we develop comprehensive theorems using paracompactness and α-open sets. Many effective characterizations and properties of this newly developed concept are obtained.

Keywords : *Texture spaces, Ditopology, Ditopological Texture spaces, α-paracompactness, α-locally finite, α-locally co-finite. 2000 AMS Subject Classification. 54C08, 54A20*

I. INTRODUCTION

In 1998 L.M.Brown introduced on attractive concept namely Textures in ditopological setting for the study of fuzzy sets in 1998. A systematic development of this texture in ditopology has been extensively made by many researchers [3,4,5,7].The present study aims at discussing the effect of α-paracompactness in Ditopological Texture spaces. Let S be a set, a texturing T of S is a subset of P(S). If

(1) (T,⊂) is a complete lattice containing S and φ, and the meet and join operations in (T,⊂) are related with the intersection and union operations in (P(S), ⊂)by the equalities
Λi∈I Ai = ∩i∈I Ai , Ai ∈ T , i ∈ I , for all index sets I, while
Vi∈I Ai = ∪i∈I Ai , Ai ∈ T , i ∈ I , for all finite index sets I.

(2) T is completely distributive.

(3) T separates the points of S. That is, given s1 ≠ s2 in S we have A ∈ T with s1∈ A, s2 ∉ A, or A ∈ T with s2 ∈ A, s1 ∉ A.

If S is textured by T we call (S,T) a texture space or simply a texture.
For a texture (S, T), most properties are conveniently defined in terms of the p-sets Ps =∩{A ∈ T \s ∈ A} and the q-sets, Qs = V{A ∈ T /s ∉ A}: The following are some basic examples of textures.
Examples 1.1. Some examples of texture spaces,
(1) If X is a set and P(X) the powerset of X, then (X; P(X)) is the discrete texture on X. For x ∈ X, Px = {x} and Qx = X \{x}.
(2) Setting I = [0; 1], T= {[0; r); [0; r]/r ∈ I } gives the unit interval texture (I; T). For r ∈ I , Pr = [0; r] and Qr = [0; r).

(3) The texture (L;T) is defined by L = (0; 1], T ={(0; r]/r∈I}For r ∈ L, Pr (0; r] = Qr .

(4) T={φ, {a, b}, {b}, {b, c}, S} is a simple texturing of S = {a, b, c} clearly Pa= {a, b}, Pb ={b}and Pc = {b, c}.
Since a texturing T need not be closed under the operation of taking the set complement, the notion of topology is replaced by that of dichotomous topology or ditopology, namely a pair (τ, κ) of subsets of T, where the set of open sets τ satisfies
1. S, φ ∈ τ
2. G1, G2 ∈ τ then G1 ∩ G2 ∈ τ
3. Gi ∈ τ , i∈ I then Vi Gi ∈ τ ,
and the set of closed sets κ atisfies
1. S, φ ∈ κ
2. K1; K2 ∈ κ then K1 ∪ K2 ∈ κ and
3. Ki ∈ κ, i ∈ I then ∩Ki ∈ κ. Hence a ditopology is essentially a 'topology" for which there is no a priori relation between the open and closed sets.

For $A \in T$ we define the closure [A] or cl(A) and the interior]A[or int(A) under (τ, κ) by the equalities $[A] = \cap\{K \in \kappa / A \subset K\}$ and $]A[= V\{G \in \tau / G \subset A\}$:

Definition 1.2. For a ditopological texture space (S; T; τ, κ):

1. $A \in T$ is called pre-open (resp. semi-open, β-open) if $A \subset$ intclA (resp. $A \subset$ clintA; $A \subset$ clintclA). $B \in T$ is called pre-closed (resp. semi-closed, β-closed) if clintB $\subset$ B (resp. intclB $\subset$ B; intclintB $\subset$ B)

We denote by PO(S; T; τ, κ) (βO(S; T ; τ, κ)), more simply by PO(S) (βO(S)) , the set of pre-open sets (β-open sets) in S. Likewise, PC(S;T; τ, κ) (βC (S; T ; τ, κ)), PC(S) (βC(S)) will denote the set of pre-closed (β-closed sets) sets.

As in [3] we consider the sets $Qs \in T$, $s \in S$, defined by $Qs = V\{Pt \mid s \notin Pt\}$

By [1.1] examples, we have Qx = X/{x}, Qr = (0, r] = Pr and Qt = [0, t) respectively. The second example shows clearly that we can have $s \in Qs$, and indeed even $Qs = S$.

Also, in general, the sets Qs do not have any clear relation with either the set theoretic complement or the complementation on T. They are, however, closely connected with the notion of the core of the sets in S.

Definition.1.3 For $A \in T$ the core of A is the set core(A) $=\{ s \in S \mid A \not\subset Qs \}$.

Clearly core(A) $\subset$ A, and in general we can have core(A) $\not\subset$ T . We will generally denote core(A) by Ab

2. Dicovers and α-locally finite

Definition 2.1 A subset C of T × T is called a difamily on (S,T). Let $C=\{(G\alpha , F\alpha)/\alpha \in A\}$ be a family on (S,T). Then T is called a dicover of (S,T) if for all partitions A1, A2 of A, we have $\cap\alpha \in A1\ F\alpha \subset V\alpha \in A2\ G\alpha$

Definition 2.2 Let (τ, κ) be a ditopology on (S,T). Then a difamily C on (S, T, τ, κ). is called α-open(co-α-open) if dom(C) $\subset$ αO(S) (ran(C) $\subset$ αO(S)).

Definition 2.3 Let (τ, κ) be a ditopology on (S,T). Then a difamily C on (S, T, τ, κ). is called α-closed(co-α closed) if dom(C) $\subset$ αC (S). (ran(C) $\subset$ αC (S)).

Lemma 2.4 [3] Let (S, T) be a texture. Then $P=\{(Ps , Qs)|s \in Sb \}$ is a dicover of S.

Corollary 2.5 [3] Given $A \in T$, $A = \emptyset$, there exists $s \in Sb$ with $Ps \subset A$.

Definition 2.6 Let (S, T) be a texture, C and C' difamilies in (S, T). Then C is said to be a refinement of C0 , written C < C0. If given A C B we have

A0 C0 B0 with $A \subset A0$ and $B0 \subset B$. If C is a dicover and C < C0 , then clearly C0 is a dicover.

Remark 2.7 Given dicovers C and D then $C \Lambda D = \{(A \cap C, B \cup D)|A\ C\ B, C\ D\ D\}$ is also a dicover. It is the meet of C and D with respect to the refinement relation.

Definition 2.8 Let $C = \{Gi , Fi)|i \in I\}$ be a difamily indexed over I. Then C is said to be (i)Finite (co-finite) if dom(C) (resp., ran(C)) is finite.

(ii) α-Locally finite if for all $s \in S$ there exists $Ks \in \alpha C (S)$ with $Ps \not\subset Ks$ so that the set $\{i|Gi \not\subset Ks\}$is finite.

(iii) α-Locally co-finite if for all $s \in S$ with $Qs \neq S$ there exists $Hs \in \alpha O(S)$ with $Hs \not\subset Qs$ so that the set $\{I \mid Hs \not\subset Fi \}$ is finite.

(iv) Point finite if for each $s \in S$ the set $\{i|Ps \subset Gi \}$ is finite.

(v) Point co-finite if for each $s \in S$ with $Qs \neq S$ the set $\{i|Fi \subset Qs \}$ is finite.

Lemma 2.9 Let (S, T, τ, κ) be a ditopological texture space and C be a difamily then, the following are equivalent:

1. $C=\{(Gi , Fi)|i \in I \}$ is α locally finite.

2. There exists a family B = {Bj |j ∈ J } ⊂ T /{ø} with the property that for A ∈ T with A = ø, we have j ∈ J with Bj ⊂ A, and for each j ∈ J there is Kj ∈ αC (S) so that Bj ⊄ Kj and the set {i|Gi ⊄ Kj } is finite.
Proof. Straightforward.

Lemma 2.10 Let (S, T, τ, κ) be a ditopological texture space and C be a difamily then, the following are equivalent:
(a) C={(Gi , Fi)|i ∈ I } is α-locally co-finite.

(b) There exists a family B = {Bj |j ∈ J } ⊂ T /{S} with the property that for A ∈ T with A ≠S, we have j ∈ J with A ⊂ Bj , and for each j ∈ J there is Hj ∈ αO(S) so that Hj ⊄ Bj and the set {i|Hi ⊄Fj } is finite.
Theorem 2.11 The difamily C={(Gi , Fi)|i ∈ I } is α locally finite if for each s ∈ S with Qs ≠ S we have Ks ∈ αC (S) with Ps ⊄ Ks , so that the set {i|Gi ⊄ Ks } is finite.
Proof. Given C={(Gi , Fi)|i ∈ I } is α locally finite ,then by Lemma 2.9 there exists a family B = {Bj |j ∈ J } ⊂ T /{ø} with the property that for A ∈ T with A ≠ ø, we have j ∈ J with Bj ⊂ A, and for each j ∈ J there is Kj ∈ αC (S) so that Bj ⊄ Kj and the set {i| Gi ⊄ Kj } is finite. Now take B = {Ps |Qs ≠ S} = {Ps |s ∈ Sb }, and for A ∈ T and A is nonempty, then by corollary 2.5 there exists s ∈ Sb with Ps ⊂ A.
Therefore for every s ∈ S, there exists Ks ∈ αC(S) with Ps ⊄ Ks such that {i|Gi⊄ Ks } is finite.
Theorem 2.12 Let (S, T, τ, κ) be a ditopological texture space and C be a α-locally finite dicover and s ∈ S. Then there exists A C B with s ∈ A and s ∉ B.
Proof. Given C={(Ai , Bi)|i ∈ I } be α-locally finite. Take K ∈αC (S) with s ∉ K and {i ∈ I |Ai ⊄ K } is finite. Now partition the set I into two sets such that I1={i ∈ I |s ∈ Ai } and I2 = {i ∈ I |s ∉ Ai , since C is a dicover it should satisfy
∩i ∈I1 Bi ⊂ Vi ∈I2 Ai
now Vi ∈I2 Ai does not have s according to our partition, which implies s ∉ ∩i∈I1 Bi . Thus we arrived at for all i∈ I1, s ∈ Ai and s ∉ Bi .(i.e) s ∈ A and s ∉ B.

Theorem 2.13 Let (S, T, τ, κ) be a ditopological texture space and C = {(Ai, Bi)|i ∈ I} be a difamily.
(1) If C is α-locally finite, then dom(C) is α closure preserving.
(2) If C is α-locally co-finite, then ran(C) is α interior preserving.
Proof. (1) Let I 0 subset of I. We have to prove αcl(Vi ∈I 0 (Ai)) = Vi∈I 0 αcl(Ai). To prove αcl(Vi∈I 0 (Ai)) ⊂ Vi∈I 0 αcl(Ai) suppose this is not true, we get there exists s ∈ S with s ∈ αcl(Vi∈I0 (Ai)) and s ∉ Vi∈I0 αcl(Ai)

αcl(Vi∈I0 Ai) ⊄ Qs and Ps ⊄ Vi∈I0 αcl(Ai) − − − − − − − (*)

Since C is α-locally finite, we have {i ∈ I |Ai ⊄ Vi∈I0 αcl(Ai)} is finite. Now partition I 0 into two sets such that
I1 = {i ∈ I 0|Ai ⊄ K } and I2 = I 0/I1

Now Vi∈I0 Ai =(Vi∈I2 ∪Vi∈I1)Ai
=(Vi∈I2 ∪ ∪i∈I1)Ai
αcl(Vi∈I0 Ai) ⊂ K ∪ ∪i∈I1 Ai
using * we can say Vi∈I0 αcl(Ai) ⊂ Qs , which is a contradiction. Therefore αcl(Vi∈I0 (Ai)) = Vi∈I0 αcl(Ai).Hence αclosure is preserving.
(2) It is the dual of (1).

REFERENCE

[1] M.E.Abd El monsef, E.F Lashien and A.A Nasef on I-open sets and Icontinuous func- tions, Kyungpook Math., 32 (1992) 21-30.
[2] L. M. Brown, M. Diker, Ditopological texture spaces and intuitionistic sets, Fuzzy sets and systems 98, (1998), 217-224.
[3] L.M. Brown, Murat Diker, Paracompactness and Full Normality in Ditopological Tex- ture Spaces, J.Math.Analysis and Applications 227, (1998)144-165.
[4] L. M. Brown, R. Erturk, Fuzzy Sets as Texture Spaces, I. Representation Theorems, Fuzzy Sets and Systems 110 (2) (2000), 227-236.
[5] L. M. Brown, R. Erturk, Fuzzy sets as texture spaces, II. Subtextures and quotient textures, Fuzzy Sets and Systems 110 (2) (2000), 237-245.
[6] L. M. Brown, R. Erturk, and S. Dost, Ditopological texture spaces and fuzzy topology, I. Basic Concepts, Fuzzy Sets and Systems 147 (2) (2004), 171-199. 3

[7] L. M. Brown, R. Erturk, and S. Dost, Ditopological texture spaces and fuzzy topology, II. Topological Considerations, Fuzzy Sets and Systems 147 (2) (2004), 201-231.
[8] L. M. Brown, R. Erturk, and S. Dost, Ditopological texture spaces and fuzzy topology, III. Separation Axioms, Fuzzy Sets and Systems 157 (14) (2006), 1886-1912.
[9] M. Demirci, Textures and C-spaces, Fuzzy Sets and Systems 158 (11) (2007), 1237-
[10] 1245.
[11] S. Dost, L. M. Brown, and R. Erturk, β-open and β-closed sets in ditopological setting, Filomat, 24(2010)11-26.
[12] J.Dontchev, On pre -I-open sets and a decomposition of I- continuity, Banyan Math.J.,
[13] 2(1996).
[14] J.Dontchev, M.Ganster and D.Rose, Ideal resolvability, Topology Appl., 93 (1) (1999),
[15] 1-16.
[16] T.R.Hamlett and D.S.Jankovic, Compatible extensions of ideals, Boll.Un.Mat. Ital., 7 (1992), 453-465.
[17] S. Jafari, Viswanathan K., Rajamani, M., Krishnaprakash, S. On decomposition of fuzzy A-continuity, The J. Nonlinear Sci. Appl. (4) 2008 236-240.
[18] O. Njastad, On some classes of nearly open sets, Pacic J. Math. 15, (1965), 961-970

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A Study on Security in Sensor Networks

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ABSTRACT

Network Management is one of the important functionality in network Engineering. This paper proposes a methodology for security in SNMP managed sensor networks. McAfee is the platform used for implementing the security. It is mainly based on SNMP V3 which is the enhanced version of SNMP and it includes authentication.IEEE1451.4 TEDS is also incorporated to provide plug and play of sensor networks. SNMP is compactable with many kind of devices used in networking, So it provides a wide varity of devices to communicate in a network independent of the manufacturers. The proposed security method is applicable to many of the sensor devices.

Indexterms*: IEEE standard, Management Information Base, Transducers.*

I. INTRODUCTION

Networks and processing systems are of growing importance and indeed ,have become critical in business world. The management of sensor network requires many functions like configuration of sensors , security , administration etc. Simple network management protocol is an application layer protocol used for managing the network devices[1]. SNMP is a network management protocol that has become the standard for the exchange of information in a network. Before the evolution of SNMP and other network management software , administrator would have to be physically attached to the network devices in order to access the configurations and troubleshooting data[12]. It uses one or more administrative computers called managers, have the task of managing and monitoring a group of devices called managed system . software executing in each devices called agent act as an interface between manager and managed system. The manager send messages to the agent to get or set a particular object of an element. The managed devices collect and store information and make this information available to the manager system using SNMP[1]. An agent will be having management information and translate that information in to SNMP compactable form. The SNMP architecture helps to achieve the following goals[1]:

1) making the management functions more simpler
2) management and operations are comparatively more flexible
3) managing complex networks and device compatibility with the network

The SNMP provides various functions to manage the devices connected with the network using SNMP ping. Various other functions are Get Request, GetNextRequest, GetBulkRequest, SetRequest,Trap , Response , Inform Request. The manager can get information regarding a particular device by using get commanriable to retrieve the value of a variable from the list of variables. Set Request to change the value of a variable by the manager. GetNextRequest to discover the available variables and there values. GetBulkRequest to get multiple iterations of GetNextRequest by the manager. Response is send by the agent to the manager as response of any of the request messages. Trap is used by the agent to notify about alerts or special events that are to be monitored. Inform Request is send by a manager to other manager as asynchronous notifications. To access the information each device will be having a unique identifier SNMP uses dotted decimal notation called Object Identifier (OID) [2].

1.1. OTHER PROTOCOLS

CMIP :Created in 1998 by Internet Activities Board (IAB).It is more secure and powerful than SNMP But the SNMP is having very less overhead .SNMP defines only "set" actions to alter the state of managed devices while CMIP allows the definition of any kind of actions. The main feature that makes SNMP different is that it is widely available and interoperable among a variety of network components.

II. MANAGEMENT OF NETWORKS

2.1MANAGEMENT INFORMATION BASE(MIB)

MIB is defined for SNMP. It is a virtual database that helps SNMP to manage, control and monitor the devices in the network .Each SNMP variables in MIB is termed as objects.MIB defines objects through framework called structure of management information(SMI) [5].The SMI is similar to the schema of a Database system. It defines object name, data type, operations that can be performed on it. To increase the scalability all managed objects are arranged in a tree structure. The leaf nodes of the tree are the actual managed objects each of which represents some activity, resource , or related information. The MIB should be compiled after its generation in order to make the SNMP work properly. The objects in MIB are defined using Abstract syntax notation 1[2].Here hierarchical name space containing OIDs are used. The path from the top of the tree down to the point of interest forms the OID.MIB's are updated to add new functionalities , remove unwanted information and to fix defects.

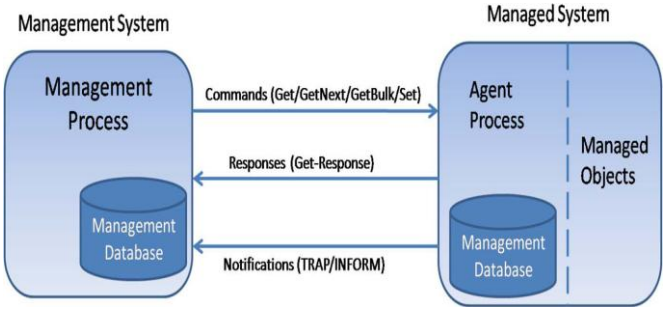

Fig1:SNMP Architecture[1]

2.2MCAFEE NETWORK SECURITY PLATFORM

Network security is one of the major aspects in computer networking. As the use of computer networks is essential part of the industries for their transactions ,the security of the system is very important[1].There are many concepts of improving or protecting network from an intruder. McAfee , the global leader in Intrusion Prevention System(IPS) provides high level security options for the system. McAfee Network Security Manager gives you real-time visibility over all McAfee intrusion prevention systems across the network. With its plug-and-play operation, easy-to-use functions Network Security Manager saves the time, trouble, and costs.

2.3IEEE 1451

The sensors must have networking capabilities that support data flow, interpretability, compatibility .security. IEEE 1451 is a new standard of managing sensor networks .It develops a vendor independent and network independent transducer interfaces. It provides many functions to make sensor smart such as[6]:

- Self-diagnostic and self-identification
- Conforming to standard data and control protocol
- Provides Standard digital data as output
- Software functions like signal processing etc

IEEE 1451.1 is Network Capable Application Model(NCAP) for smart transducer was developed in 1999 .It provides a Common Object model that can be used with multiple networking protocols. Uniform models for key functions needed in smart transducers including physical parametric data, application functionality and communication. It develops a framework that helps to create smart transducers.
IEEE1451.2 is introduced in 1997 and is known as Extensible Transducer Electronic Data Sheet (TEDS).It is basically a general calibration model for transducers. Triggering and control models define how the channel are accessed. It has a power concepts of correction engine and flexible location of correction engine and contains different kinds of sensors.IEEE 1451.3 is Digital Communication and Transducer Electronic Data Sheet (TEDS) Formats for Distributed Multidrop Systems.

IEEE1451.4 Transducer Electronic Data Sheet-used for plug and play of sensor networks.TEDS(Transducer Electronic Data Sheet) TEDS is a volatile memory inside sensor to store information. The sensor manufacturer uses this memory to store details regarding the manufacturer name, model number , serial number, sensor type and calibration data. The sensor works in two different modes such as analog and digital. In the digital mode the sensor data inside the memory can be downloaded, in the analog mode the sensor basically does the .TEDS basically is meant for plug and play of sensors. The memory in the TEDS are of two types,1)Volatile memory (RAM) 2)Permanent memory (ROM).The permanent memory stores data about the sensor manufacturer and other specification of the sensor .Volatile memory stores only the current measurement values . The IEEE 1451.4 defines TEDS as different sections chained together to form a complete TEDS. The first section is the Basic TEDS which defines the essential details regarding the sensor. Optionally , this standard template TEDS is followed by a calibration template. Two-bit selectors in the TEDS data indicate the following section. The end section of the TEDS is specified as open user area.

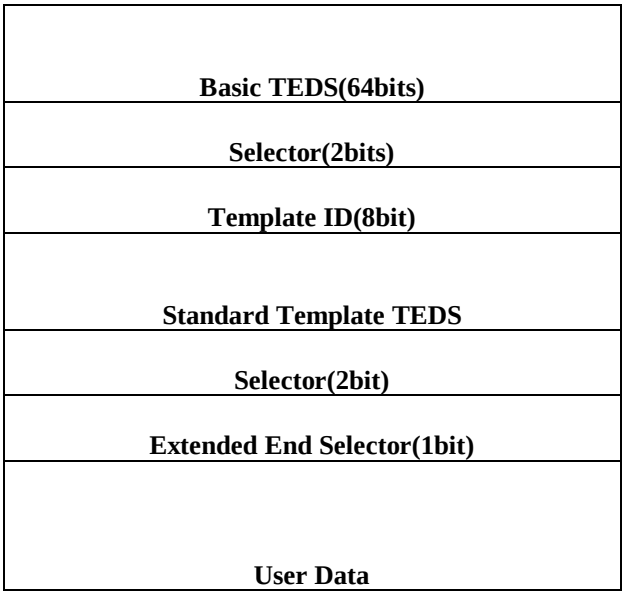

Fig2:Transducer with standard TEDS content

There are many advantages for TEDS:
1) Transducer contains data sheet information
2) No connection to PC is required
3) It can be used with many measurement points and with frequency changing configurations.
4) Makes measurements faster
5) Compactable with any kind of network and is not vendor specific.

III. RELATED WORKS

There are many papers that proposes methods for management of sensor networks. Sensor networks can be managed using Simple Network Management protocol . There are so many other protocols such as CMIP which is more effective in network management but SNMP is more simple and easy to implement. Previously there where many approaches in management of sensor networks using SNMP based MIB by considerably reducing the overhead in the network. Live Node Non-invasive Context-aware and modular Management (LiveNCM) it is a wireless sensor network management tool it is divided in to two parts one is centralized on the fixed network structure and another one, distributed on each node. Each part introduces the concept of non-invasive context aware to reduce data exchanges and diagnoses the wireless sensor node state with few messages.LiveNMC is based on Live node platform to validate energy consumptions. The main objective was to minimize the energy consumption by reducing the message exchanges. SNMP-based smart transducer interface module (STIM) is economical and scalable solution for sensor networks.

It provides a transducer independent network accessible interface, which is useable to formalize the control of devices with different functions. This MIB contains meta, meta identification, channel identification, channel, calibration, and calibration identification of TEDS information. The Entity MIB

developed in1996 uses single agent to manage multiple instances of one MIB. The Entity Sensor MIB contains a single group called the entitySensorValue group, which defines objects to convey current value and status of a physical sensor. This group contains a single table called entSensorTable, which provides a small number of READ-only objects. Management and Plug and Play of Sensor Networks Using SNMP developed in 2011 is an extension to entity sensor combines TEDS to generate a new method for management end plug and play of sensor networks. IEEE1451.4 is use to provide plug and play of sensor networks. It makes the sensor compactable with any kind of networks .The security aspects of the sensor by integrating SNMP is not implemented. IEEE 1451.4 TEDS provides the plug and play of instruments .It helps in the simplification of cable identification provides a class of templates categorizing common types of sensors. TEDS is a key feature that automates the process of inputting sensor related information . By using TEDS in defining MIB's ,it is easy to identify and manage the sensor independent of the manufacturers. This makes the sensor SNMP compatible. IEEE1451.4 will reduce the challenges associated with the sensor configurations. The entity sensor MIB can be extended to accommodate the sensor information .There are Template25 TEDS table for Template ID=25 and Template 36 TEDS table for Template ID=36 which uses Entity sensor MIB concept .

3.1.MCAFEE NETWORK SECURITY SENSORS

McAfee, the global leader in network intrusion prevention systems (IPS), delivers unprecedented levels of security offering flexible deployment options that allow organizations to optimize investment in network security. McAfee Network Security Platform provides category-best security effectiveness, scalable performance, and next-generation network IPS controls that take guesswork out of management. With Network Security Platform you get a unified network security solution for physical and virtual environments that streamlines security operations and protects your business from the latest network security threats, including malware, zero-day attacks, botnets, denial-of-service attempts, and advanced targeted attacks. It enables you to take control of your network with predictive threat intelligence, application visibility and control, network behavior analysis, and real-time threat awareness.

IV. PROPOSED MODEL

4.1 DESIGN CONSIDERATIONS

The SNMP MIB is used to store the details regarding the sensor related information. The main aim is to provide security aspects of SNMP integrated with the sensor network management. The primary goal in sensor network is to minimize the energy usage by minimizing the messages.SNMP V3 provides two types of security models User Security model and Transport Security Model. MIB is first created by using MIB editor utilities provided by the web NMS SNMP C agent. After generating the MIB design next step is to compile MIB using the tool kit. Then the Generic code can be modified based on the user requirements. Once the management system is ready next step is to provide integrated security .Here we uses McAfee network security platform for the security constraints The procedure is as shown below:

Environment

McAfee Network Security Platform

Configure the Sensor to allow an SNMP PULL and providing security:

1.Configure the SNMP v3 User:

a. Open the Network Security Manager.

b. Select the Sensor to be configured.

c. Add the account to be used by the user:

i. Select **Remote Access**, **SNMP v3 User**.

ii. Add a user with a minimum **8 character** username with authentication.

d. Add the IP address of the client that need the information of the Sensor:

i.Select the Sensor and click **Remote Access** as **Permit NMS**.

ii.Add the IP address of the client (multiple IP addresses can be added).

2. Load the Sensor MIBs.

MIBs are provided in the **NSM installation directory** in the **config** folder. The default path is **C:\Program Files\McAfee\Network Security Manager\App\config**.

The **MCAFEE-INTRUVERT-EMS-TRAP-MIB** is for the Manager, the others are for the Sensor.
a. Open your MIB Browser client.
b.Load the Sensor MIBs:
i.Select V3.
Select Algorithm MD5 and Privacy Algorithm DES.
ii.Add the username and password (previously configured in the Manager).
iii.Load the MIB.
At the top of the MIB is the entry: iso.org.dod.internet.private.enterprise.mcafee-intruvert which translates to 1.3.6.1.4.1.8962.
3.Use a command line tool to query the Sensor.
a. Open a command-line session on a Linux client.
b.Use the snmpwalk command to locate the Sensor model number. Type the command below and press ENTER:

snmpwalk –v3 –t10 –a MD5 –A <authentication-key> –x DES –X <private-key> –u <username> –l authPriv <sensor-IP> .1.3.6.1.4.1.8962.2.1.2.1.1.1
You see the Sensor model number displayed. Alternatively, you can choose the OID and pull the specific information.

4.Configure the Network Security Manager to send a trap to an SNMP manager.

a.In the Manager, select the company name from the tree on the left.
b.In the right pane, select Fault Notification, SNMP.
c.Click New.
d.Add the IP address of the SNMP manager.
e.Select the SNMP version (1 or 2). If you are unsure which version is correct, select both.
f.Select the severity level based on the alerts you want to receive.
g.Click **Finish**.
h.Open the SNMP manager and create a fault to confirm that the fault notification trap is received

This method will provide security for sensors by McAfee up to some extent.

V. CONCLUSION

The management and plug and play of sensor networks using SNMP is already implemented and Here we provide security aspects of sensor networks by integrating SNMP.Here we uses McAfee security platform which is a globally accepted IPS system. The security is provided by using SNMP V3 which have the authentication mechanism of users. But it cannot be implemented for all kinds of sensor devices.

VI. FUTUREWORK

The proposed security methodology is only applicable to some sensors. It is only supported by McAfee security systems. This can be extended to all kind of sensor devices .

REFERENCES

[1] Management and Plug and Play of Sensor Networks Using SNMP Syed Alamdar Hussain, Student Member, IEEE, and Deniz Gurkan, Member, IEEE, IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT, VOL. 60, NO. 5, MAY 2011
[2] J. D.Case, M. S. Fedor, M. L. Schoffstall, and J. R. Davin, A Simple Network Management Protocol, (SNMP), DDN Network Information
Center, SRI Int., May 1990, RFC 11 57.
[3] J. Case, R. Mundy, D. Partain, and B. Stewart, Introduction to Version 3 of the Internet-Standard Network Management Framework, Apr. 1999, RFC 2570.
[4] J. Case, K. McCloghire, M. Rose, and S. Waldbusser, Introduction to Version 2 of the Internet-Standard Network Management Framework,
Apr. 1993.
[5] F. Kastenholz, SNMP Communications Services, Oct. 1991, RFC 1270.
[6] M. Rose and K. McCloghire, Structure and Identification of Management Information for TCP/IP-Based Internets, May 1990, RFC 1155.
[7] K. McCloghire and M. Rose, Management Information Base for Network
Management of TCP/IP-Based Internets: MIB-II, Mar. 1991, RFC 1213.
[8] Int. Org. Standardization, Information Processing Systems—Open Systems Interconnection—Specification of Abstract Syntax Notation One (ASN.1), Int. Std. 8824, Dec. 1987.

[9] M. Rose and K. McCloghire, Concise MIB Definitions, Mar. 1991, RFC 1212.
[10] S. Gumudavelli, D. Gurkan, and R. Wang, "Emulated network of IEEE 1451 application with multiple smart sensor reports," in Proc. IEEE
Sensor Appl. Symp., New Orleans, LA, 2009, pp. 304–308.
[11] IEEE, IEEE Standard for a Smart Transducer Interface for Sensors and Actuators—Network Capable Application Processor (NCAP) Information Model, IEEE Std. 1451.1, 1999.
[12] IEEE, IEEE Standard for A Smart Transducer Interface for Sensors and Actuators—Mixed-Mode Communication Protocols and Transducer
Electronic Data Sheet (TEDS) Formats, IEEE Std. 1451.4, 2004.
[13] A. Jacquot, J.-P. Chanet, K. M. Hou, X. Diao, and J.-J. Li, "A new approach for wireless sensor network management: LiveNCM," in Proc.
NTMS, Nov. 2008, pp. 1–6.
[14] B. Scherer, C. Toth, T. Kovacshazy, and B. Vargha, "SNMP-based approach to scalable smart transducer networks," in Proc. 20th IEEE IMTC, May 2003, pp. 721–725.
[15] K. McCloghrie and A. Bierman, Entity Management Information Base, Oct. 1996, RFC 2037.

Design and Simulation of Nonisolated ZVZCS Resonant PWM Converter for High Step-Up and High Power Applications

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ABSTRACT

This paper proposes a generalized scheme of new soft-switched interleaved boost converters that is suitable for high step-up and high power applications. The proposed converter is configured with proper numbers of series and parallel connected basic cells in order to fulfill the required output voltage and power levels respectively. This leads to flexibility in device selection resulting in high component availability and easy thermal distribution. Design examples of determining the optimum circuit configuration for given output voltage gain of 8.75times is presented.

***KEY WORDS**: High Step-Up, High Voltage Gain, Multiphase, Non-isolated, Soft Switched.*

I. INTRODUCTION

Recently, high step-up dc-dc converters do not require isolation have been used in many applications such as dc back-up energy systems for Uninterruptible Power Systems(UPS), renewable energy systems, fuel cell systems and hybrid electric vehicles. Generally, the high step-up dc-dc converter for these applications has the following requirements.

[1] High step-up voltage gain. Sometimes the voltage gain could be more than 10.
[2] High current handling capability.
[3] High efficiency at a desired level of volume and weight.
[4] Low input current ripple.

In order to provide high output voltage, the classical boost converter should operate at extremely duty cycle and then the rectifier diode must sustain a short pulse current with high amplitude. This results in severe reverse recovery as well as high EMI problems. Using an extremely duty cycle may also lead to poor dynamic responses to line to load variations. Moreover, in the high step up dc-dc converter the input current is usually large, and hence low voltage rated MOSFETs with small RDS(ON) are necessary in order to reduce the dominating conduction loss. However, the switch in the classical boost converter should sustain high output voltage as well, and therefore, the device selection is faced with a contradiction.A lot of step-up dc-dc converter topologies have been presented to overcome the aforementioned problem. Converters with Coupled inductors [1]-[5] can provide high output voltage without using high duty cycle and yet reduce the switch voltage stress. The reverse recovery problem associated with rectifier diode is also alleviated. However, they have large input current ripple and are not suitable for high power applications since the capacity of the magnetic core is considerable. The switched-capacitor converter [6]-[10] does not employ an inductor making it feasible to achieve high power density. However, the efficiency could be reduced to allow output voltage regulation. The major drawback of these topologies is that attainable voltage gains and power levels without degrading system performances are restricted.Most of the coupled-inductor and switched-capacitor converters are hard switched and therefore, they are not suitable for high efficiency and high power applications. Some soft switched interleaved high step-up converter topologies [11]-[18] have been proposed to achieve high efficiency at desired level of voltage and power level.

In this paper, a new interleaved soft switched high step-up dc-dc converter for high efficiency, high voltage applications are presented. The proposed converter has the following advantages.

[1] Reduced voltage stresses of switches and diodes,
[2] ZVS turn-on the switches and ZCS turn-off the diodes.
[3] Low input current ripple due to interleaved structure.
[4] Reduced energy volumes of most passive components.
[5] Extendibility to desired voltage gain and power level.

The operating principles alog with a design example of the proposed converter are described. Experimental results from a 1.5-KW prototype are also provided to validate the proposed concept.

II. PROPOSED INTERLEAVED HIGH STEP-UP CONVERTER

2.1.General Architecture

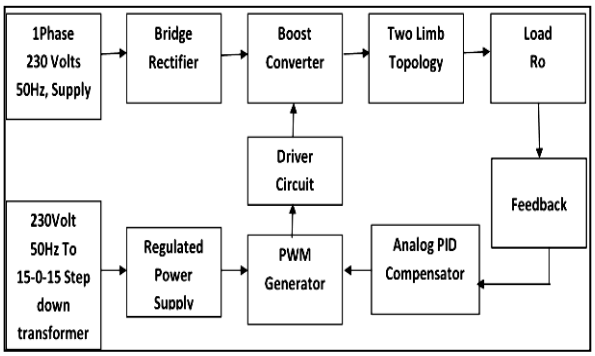

Fig. 1. General Architecture

Fig.1. Block diagram of general architecture

Architecture Description

Fig.1 shows the Architecture of the proposed converter. The single phase AC supply is converted into DC supply and applied to boost converter. Due to two limb topology the output power is greatly increased compared to that of conventional converter. The switch is controlled by means of PWM technique. Hence controlled DC voltage is applied to the DC Load.

B. GENERALIZED MULTIPHASE DC-DC CONVERTER

Fig. 2 shows a basic cell used as a building block to build the proposed high step-up converter. The basic cell consists of an input filter inductor, a switch leg and diode leg, and an auxiliary inductor, and capacitor.

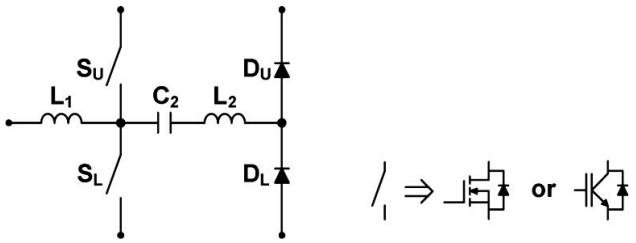

Fig. 2 Basic cell of the proposed interleaving high step-up converter.

Fig. 3 shows the generalized circuit of the proposed converter with *N* and *P*, where *N* is the number of output series-connected basic cell and *P* is the number of output parallel-connected basic cell, respectively, meaning that there exist totally *N.P* basic cells. The diode leg of npth basic cell is connected to the output capacitor C*3,n*, where *n*=1,2,3,…..*N* and *p*=1,2,3,….*P*, and output capacitors C3,1 to C*3,N* are connected in series on top of output capacitor C1 to form the output voltage. That is, "*N*" could be increased to get higher output power. It should be noted that the voltage rating of switches can be reduced by reducing *N* and the current rating of them can be reduced by increasing *N* or *P*. Also, the voltage and current ratings of diodes can be reduced by increasing *N* and *P*, respectively. Therefore, optimum devices in the sense of cost and availability can be selected proper choice of *N*&*P*.The interleaving technique can be applied to reduce the size of input filter inductors and output filter capacitors. Therefore, "*N*"and "*P*" can properly be chosen according to given output voltage and power level. This could give flexibility in device selection resulting in optimized design even under harsh design specifications.

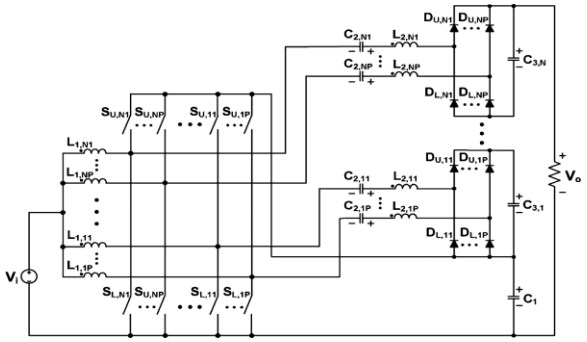

Fig. 3. Generalized circuit topology of the proposed interleaved high step-up dc–dc converter (N is the number of output series-connected basic cell, and P is the number of the output parallel-connected basic cell).

III. CIRCUIT DIAGRAM

Fig. 4.shows the circuit diagram of the proposed converter which has the same circuit topology as the PWM method proposed in [14]. Fig.5. shows key waveforms illustrating the operating principle of the proposed converter .The proposed converter consists of a general boost converter as the main circuit and an auxiliary circuit which includes capacitor *Cr*, inductor *Lr* and two diodes *DL* and

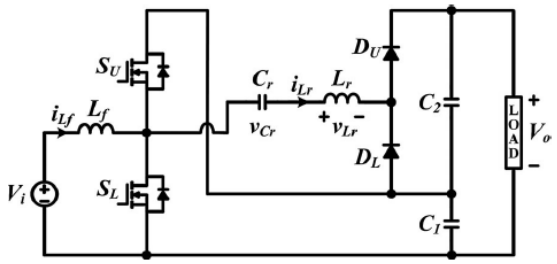

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Fig.4.Circuit diagram of the Proposed Converter

Two switches are operated with asymmetrical complementaryswitching to regulate the output voltage. Owing to the auxiliary circuit, not only output voltage is raised but ZVS turn-on of two switches can naturally be achieved in CCM by using energy stored in filter inductor *Lf* and auxiliary inductor *Lr*. Unlike PWM method [14] in which the switches are turned OFF with high peak current the proposed converter utilizes *Lr-Cr*resonance of auxiliary circuit, thereby reducing the turn-off current of switches. Futhermore, for resonance operation, the capacitance of *Cr* is reduced volume. Also, switching losses associated with diode reverse recovery of the proposed RPWM converter are significantly reduced.

IV. OPERATING PRINCIPLE

The operating modes and key waveforms of the proposed converter are shown in Figs. 5 and 6. In the below resonance operation, five modes exist within *Ts*. *Mode 1 ($t_0 - t_1$)*: This mode begins when upper switch S_U which was carrying the current of difference between i_{Lf} and $i_{Lr}$is turned OFF. S_L can be turned ON with ZVS if gate signal for S_L is applied before the current direction of S_L is reversed. Filter inductor current i_{Lf} and auxiliary current i_{Lr}starts to linearly increase and decrease, respectively, as follows

$$i_{Lf}(t) = \frac{V_i}{L_f}(t - t_0) + i_{Lf}(t_0)$$

$$i_{Lr}(t) = \frac{V_{Cr,\min} - V_o}{L_r}(t - t_0) + i_{Lr}(t_0)$$

This mode ends when decreasing current i_{Lr}changes its direction of flow. Then D_U is turned OFF under ZCS condition.

Mode 2 (t_1-t_2) : This mode begins with L_r-C_r resonance of the auxiliary circuit. Current i_{Lf} is still linearly increasing. The voltage and current of resonant components are determined, respectively, as follows:

$$i_{Lr}(t) = -i_{Cr}(t) = \frac{V_{r,2}}{Z}\sin\left(\omega_r(t-t_1)\right)$$

$$v_{Cr}(t) = V_{r,2}\left[\cos\left(\omega_r(t-t_1)\right)-1\right] + v_{Cr}(t_1)$$

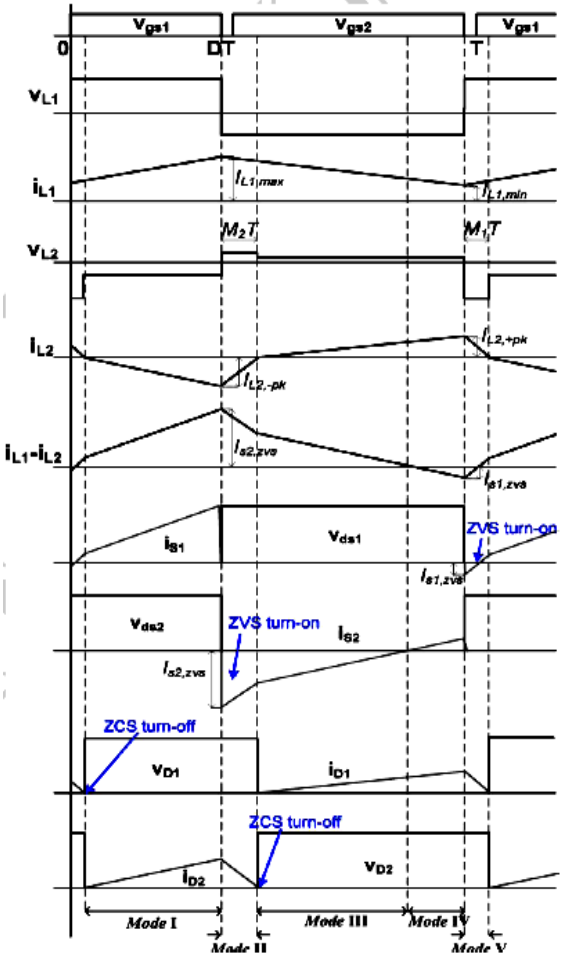


Fig. 5.Key waveforms of the proposed converter

Where $V_{r,2} = V_{Cr,min} - V_{C1}$, $Z = \sqrt{L_r/C_r}$ and $\omega_r = 1/\sqrt{L_r/C_r}$. Ths resonance mode ends when i_{Lr} reaches to zero. Note that D_L is turned OFF under ZCS condition.

Mode 3 ($t_2 - t_3$) : There is no current path through the auxiliary circuit during this mode. Output capacitors supply the load. At the end of this modethe turn-off signal of S_L is applied. It is noted that the turn-off current of S_L,$I_{SL,off}$ is limited to filter inductor current at t_3,$I_{Lf,max}$, which is much smaller than that of PWM method.

Mode 4($t_3 - t_4$) : This mode begins when lower switch S_L is turned OFF. S_U can be turned ON with ZVS if gate signal for S_U is applied before the current direction of S_U is reversed. Filter inductor current i_{Lf}starts to linearly decrease since voltage V_{Lf}becomes negative

$$i_{Lf}(t) = \frac{V_i - V_{C1}}{L_f}(t-t_3) + i_{Lf}(t_3).$$

Like Mode 2, the other L_r-C_r resonance of auxiliary circuit is started, and D_U starts conducting. The voltage and current of resonant components are determined, respectively, as follows:

$$i_{Lr}(t) = -i_{Cr}(t) = \frac{V_{r,4}}{Z}\sin\left(\omega_r(t-t_3)\right)$$

$$v_{Cr}(t) = V_{r,4}\left[\cos\left(\omega_r(t-t_3)\right)-1\right] + v_{Cr}(t_3)$$

where $V_{r,4} = V_{Cr,max} - V_{C2}$, $Z = \sqrt{L_r/C_r}$ and $\omega_r = 1/\sqrt{L_r/C_r}$.

This mode ends when i_{Lr} is equal to i_{Lf}.

Mode 5 ($t_4 - t_5$) : After i_{Lr} equals i_{Lf}, i_{SU} changes its direction, then this mode begins. At the end of this mode, turn-off signal of S_U is applied and this mode ends.

V. VOLTAGE CONVERSION RATIO

To obtain the voltage gain of the proposed converter, it is assumed that the voltage across C_1 and C_2 are constant during the switching period T_s. The output voltage is given by

$$V_o = V_{C1} + V_{C2}$$

It can also be expressed as

$$V_o = \frac{2}{1-D_{\text{eff}}}V_i = \frac{2}{1-D}V_i - \Delta V$$

where effective duty $D_{eff}$and voltage drop ΔV are expressed using duty loss ΔD.

$$D_{\text{eff}} = D - \Delta D$$

$$\Delta V = \frac{2\Delta D V_i}{(1-D)(1-D_{\text{eff}})}.$$

V_{C1}that is the same as output voltage of the boostconverter can be expressed as

$$V_{C1} = \frac{1}{1-D}\cdot V_i.$$

Design is carried out for findingLf, fr,Lr and Cr

A. Design of Lf

V_{C2} can be expressed as

$$V_{C2} = \frac{1}{1-D}V_i - \Delta V.$$

In the steady state, the average load current equals the average current of diodes D_L and D_U. Since i_{Lr}, flows through the $D_L$during mode 2, the average load current can be obtained as follows.

$$I_{\text{DL,av}} = \frac{V_o}{R_o} = \left|\frac{2}{T_s}\int_0^{T_r/4}(V_{Cr,\min} - V_{C1})\frac{\sqrt{C_r}}{\sqrt{L_r}}\sin(\omega_r t)\cdot dt\right.$$

From the above equation, $V_{Cr,min}$ and $V_{Cr,max}$ can be obtained by,

$$V_{Cr,\min} \approx V_{C1} - \frac{V_o}{2C_r R_o f_s}$$

$$V_{Cr,\max} \approx V_{C1} + \frac{V_o}{2C_r R_o f_s}.$$

VI. DESIGN OF THE PROPOSED CONVERTER

The generalized scheme of the proposed converter has been shown in Fig.3.,where it is configured with proper numbers of series and parallel connected basic cells. This leads to flexibility in device selection resulting

in high-component availability and easy thermal distribution. A specification for a design example in this paper is given as follows and the chosen circuit topology for the specifications is shown in Fig.4.

Po =220 W, Vo = 105 V, Vi = 12 V, fs= 15 kHz, ΔIin = 20%, ΔVo = 3%.

Considering input current ripple $\Delta I_{in,}$ input inductor L_f is determined by,

Lf = 0.5(1-D).V_{in}/ ΔI_{in}. f_s = 70µH.

B. Design of f_r

Due to the smaller switch turn off current and duty loss, the below-resonance operation is chosen, and the resonant frequency f_r can be obtained from

$f_r = 1 / 2\pi\sqrt{L_rC_r}$ and

$f_r = 1 /2D_{eff.}$

So, $f_r \leq 42$ kHz

C. Design of L_r and C_r

From the resonant frequency $f_{r,}$

L_r = 3 µH &

C_r= 4.7 µF.

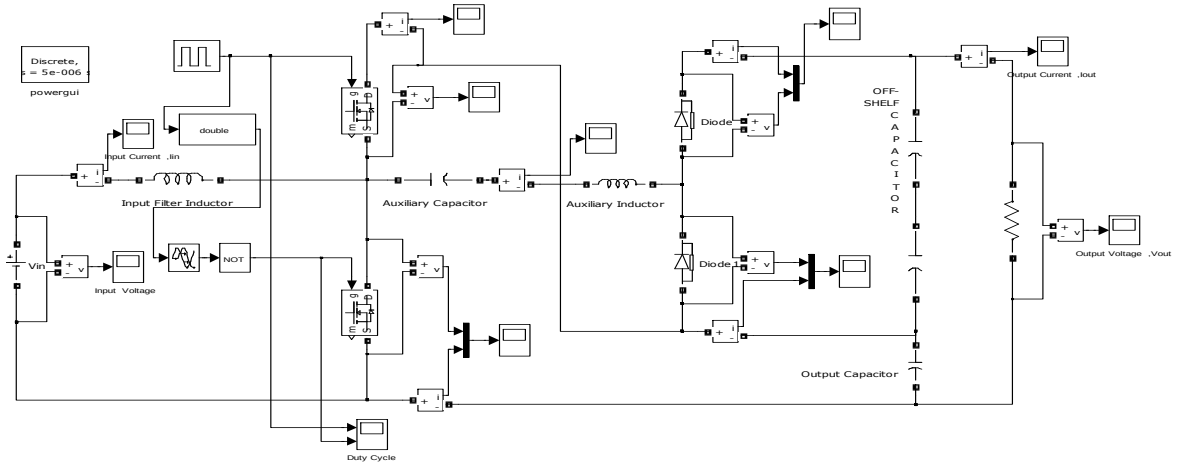
The improvement of the proposed RPWM method compared to PWM method are summarized as follows.

1) Due to the reduced operation duty, the rms current ratings of the switches are reduced by 5-15%, resulting in reduced conduction losses.

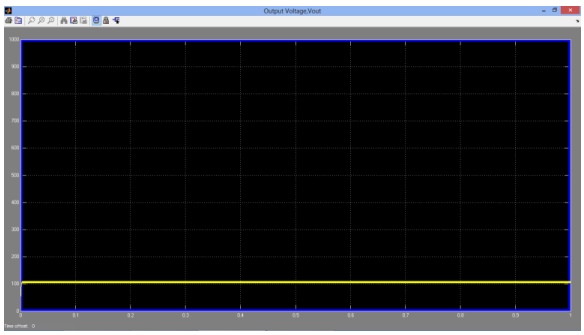
2)Due to the resonant operation, the turn-off current of switches are reduced by 25-60% and falling slopes of the diode current are reduced, resulting in significantly reduced switching losses.

3)The required capacitance of auxiliary capacitor is dramatically reduced to 1/20th resulting in reduced volume and cost.

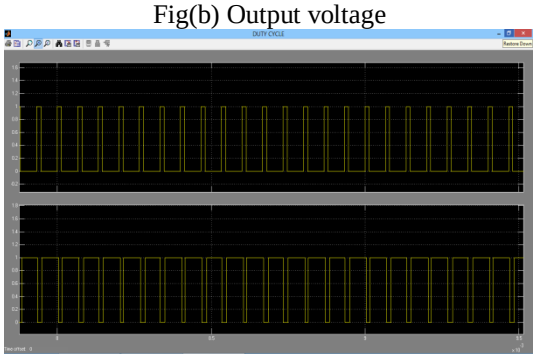
VII. SIMULATION CIRCUIT



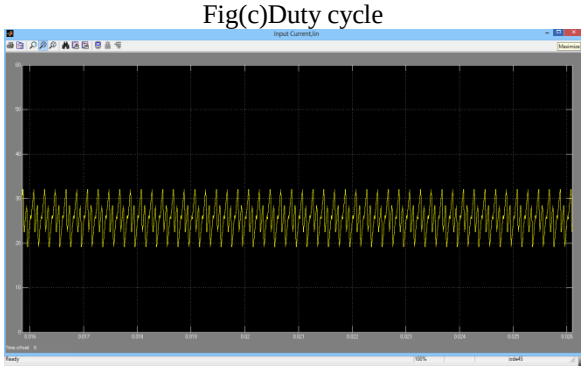
Fig(a) Input voltage



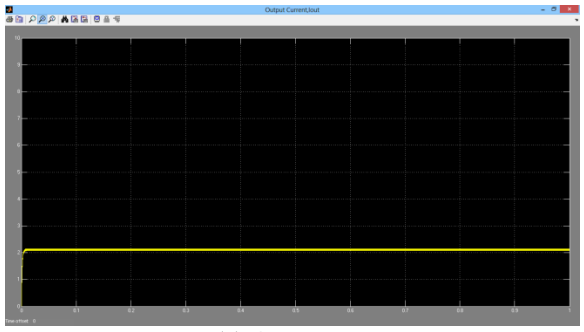
Fig(b) Output voltage



Fig(c)Duty cycle



Fig(d) Input current



Fig(e) Output current

V. CONCLUSION

In this paper, an RPWM method switching method has been proposed for high step-up soft switching dc-dc converter. The proposed converter has the following advantages:

The proposed converter has the following advantages:

a. ZVS turn-on of the active switches in CCM.
b. Negligible diode reverses recovery due to ZCS turn-off of the diodes.
c. Greatly reduced passive components and voltage ratings.
d. Its voltage gain is 8.75 times, is doubled with the classical boost converter.

REFERENCES

[1] K. Hirachi, M. Yamanaka, K. Kajiyama, and S. Isokane, "Circuit configuration of bidirectional DC/DC converter specific for small scale load leveling system," in *Proc. IEE Power Conv. Conf.*, Apr. 2002, vol. 2, pp. 603–609.

[2] Q. Zhao and F. C. Lee, "High-efficiency, high step-up DC–DC converters," *IEEE Trans. Power Electron.*, vol. 18, no. 1, pp. 65–73, Jan.2003.

[3] T. J. Liang and K. C. Tseng, "Analysis of integrated boost-flyback step-up converter," in *Proc. IEE Electr. Power Appl.*, Mar. 2005, vol. 152, no. 2, pp. 217–225.

[4] [4] R. J. Wai and R. Y. Duan, "High-efficiency DC/DC converter with high voltage gain," in *Proc. IEE Electr. Power Appl.*, Jul. 2005, vol. 152, no. 4, pp. 793–802.

[5] B. Axelrod, Y. Berkovich, and A. Ioinovici, "Switched coupled-inductor cell for DC–DC converters with very large conversion ratio," *IEEE Int.Conf. (IECON)*, pp. 2366–2371, Nov. 2006.

[6] M. S. Makowski, "Realizability conditions and bounds on synthesis of switched-capacitor dc–dc voltage multiplier circuits," *IEEE Trans. Circuits*

[7] *Syst. I. Fundam. Theory Appl.*, vol. 44, no. 8, pp. 684–691, Aug. 1997.

[8] O. C.Mak,Y. C.Wong, andA. Ioinovici, "Step-upDC power supply based on a switched-capacitor circuit," *IEEE Trans. Ind. Electron.*, vol. 42, no. 1, pp. 90–97, Feb. 1995.

[9] O. Abutbul, A. Gherlitz, Y. Berkovich, and A. Ioinovici, "Step-up switching-mode converter with high voltage gain using a switchedcapacitor circuit," *IEEE Trans. Circuits Syst.-I*, vol. 50, no. 8, pp. 1098–1102, Aug. 2003.

[10] B. Axelrod, Y. Berkovich, and A. Ioinovici, "Transformerless DC–DC converterswith a very highDCline-to-load voltage ratio," in *Proc.Circuits Syst., Int. Symp. Circuits Syst. (ISCAS)*, May 2003, vol. 3, pp. III435– III438.

[11] B. Axelrod, Y. Berkovich, and A. Ioinovici, "Switched-capacitor/switched-inductor structures for getting transformerless hybrid DC–DC PWM converters," *IEEE Trans. Circuits Syst. I: Regul. Paper*, vol. 55, no. 2, pp. 687–696, Mar. 2008.

[12] E. H. Ismail, M. A. Al-Saffar, A. J. Sabzali, and A. A. Fardoun, "A family of single-switch PWM converters with high step-up conversion ratio,"*IEEE Trans. Circuits Syst. I: Regul. Paper*, vol. 55, no. 4, pp. 1159–1171, May 2008.

[13] R. Giral, L. S. Martinez, and S. Singer, "Interleaved converters operation basedonCMC," *IEEE Trans. Power Electron.*, vol. 14, no. 4, pp. 643–652, Jul. 1999.

[14] P. W. Lee, Y. S. Lee, D. K. Cheng, and X. C. Liu, "Steady-state analysis of an interleaved boost converter with coupled inductors," *IEEE Trans.Ind. Electron.*, vol. 47, no. 4, pp. 787–795, Aug. 2000.

[15] B. Huang, I. Sadli, J. P. Martin, and B. Davat, "Design of a high power,high step-up non-isolated DC–DC converter for fuel cell applications,"*IEEE Vehicle Power Propulsion Conf. (VPPC)*, pp. 1–6, Sep. 2006.

[16] L. Palma, M. H. Todorovic, and P. Enjeti, "A high gain transformer-less DC–DC converter for fuel-cell applications," *IEEE Power Electron.Spec.Conf. (PESC)*, pp. 2514–2520, Jun. 2005.

[17] D. Coutellier, V. G. Agelidis, and S. Choi, "Experimental verification of floating-output interleaved-input DC–DC high-gain transformer-less converter topologies," *IEEE Power Electron. Spec. Conf. (PESC)*, pp. 562– 568, Jun. 2008.

[18] R. N. A. L. Silva, G. A. L. Henn, P. P. Prac¸a, L. H. S. C. Barreto,D. S. Oliveira, Jr., and F. L. M. Antunes, "Soft-switching interleaved boost converter with high voltage gain," *IEEE Power Electron. Spec.Conf. (PESC)*, pp. 4157–4161, Jun. 2008.

[19] W. Li and X. He, "High step-up soft switching interleaved boost converters with cross-winding-coupled inductors and reduced auxiliary switch number," *IET Power Electron.*, vol. 2, no. 2, pp. 125–133, Mar. 2009.

[20] S. Park and S. Choi, "Soft-switched CCM boost converters with high voltage gain for high-power applications," *IEEE Trans. Power Electron.*,vol. 25, no. 5, pp. 1211–1217, May 2010.

[21] Dinesh K" Analysis of Multiphase Boost Converter for High Power Application" International Journal of Applied Information Systems (IJAIS) – ISSN : 2249-0868 Foundation of Computer Science FCS, New York, USA Volume 1– No.7, March 2012.

[22] R.Saktheeswaran, S.Sulthansikkanderbadusha, A.Parthiban," High-Power Applications CCM Boost Converter with Two Limb Topology Using Soft-Switching Techniques" International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 Vol. 3, Issue 2, March -April 2013, pp.1752-1756.

[23] Ganga jeyadevi.R, low loss soft-switching boost converter with hi-bridge auxiliary resonant circuit, International Journal of Communications and Engineering Volume 04– No.4, Issue: 02 March2012.

[24] *C.Benin,Dr.M.Sasikumar," Simulation And Analysis Of Soft-switching Ccm Boost Converter With High Power Applications "IOSR Journal of Engineering (IOSRJEN) , Vol. 2 Issue 2, Feb.2012, pp.203-206 .*

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Evaluating the Privacy Measure of the Source Location Privacy Scheme in a Wireless Sensor Network

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ABSTRACT:
Implementing Source Location Privacy Makes It Possible To Hide The Location Information Of The Transmitting Node. Classified As A Contextual Privacy Protection Technique, The Source Location Privacy Is An Essential Feature Of Those Real Life Sensor Networks Which Have Been Deployed For Monitoring Events Happening At Particular Locations. This Paper Designs A Source Location Privacy Scheme Using Cluster Based Anonymization And Random Routing. The Privacy Measure Index Is Then Evaluated In Order To Estimate The Overall Privacy Achieved By The SLP Scheme. The Effect Of The Privacy Scheme On End To End Message Delay Is Observed, For Estimating The Network Performance Degradation And Establishing The Efficacy Of The SLP Scheme.

KEYWORDS: *Anonymization, Message Delay, Privacy Measure, Routing, Source Location Privacy*

I. INTRODUCTION

The privacy threats of wireless sensor networks (WSN) can be classified into two broad categories: Content privacy and context privacy. Source location privacy comes under the purview of contextual privacy, in which the context information, like the location of the source node, its identity; or temporal information like the time and duration of transmission, is kept hidden from unintended users. Content privacy generally relies on data encryption for providing data security in WSN. This approach of encryption can become counter-productive because cryptographic algorithms are computationally intensive and can deplete the scarce energy resources of the WSN. This paper designs a source location privacy scheme which does not require encryption and uses the concepts of anonymization of node identities along with random routing of source messages in order to enable privacy. The model of the SLP scheme is first developed and then analyzed using information theoretic approach of entropy and probability. Simulation is performed to test the process of cluster formation, anonymization of node identities and random routing, and obtain relevant observations to evaluate the privacy measure index of the SLP scheme.

The section wise organization of the rest of the paper is as follows. Section 2 discusses the various context oriented privacy protection techniques. Section 3 describes the model and analyzes the proposed SLP scheme. Section 4 presents the experimental observations achieved through simulation. Section 5 concludes the paper.

II. CONTEXTUAL PRIVACY TECHNIQUES

From the study of related works in privacy protection techniques it is clear that context privacy protection can be implemented in variety of ways. In [1] Celal Ozturk et discuss the strategy of baseline flooding for implementing source location privacy. In this technique every new message is transmitted only once by each node that receives it; and every node broadcasts the message to its neighbours provided it is receiving the message for the first time. But this process consumes energy and it is also possible to backtrack to the source node. They also describe the technique of fake message flooding where fake messages are fed into the actual message traffic so that the source of the message remains unknown. In [2] Guillermo Suarez-Tangil et al. conclude that fake messaging gives excellent source location privacy, but it becomes difficult to efficiently create fake sources and define the optimal message generation rate for the fake sources. In [3] Hillol Kargupta et al. focus on the data perturbation approach to mask the data. In [4] Xiaoxin Wu uses an approach of

pseudonym, where instead of the real identity of a node, a false identity is used. The author uses positions of destinations as pseudonyms to be used in place of actual node identities. . In [5] Jing Deng et.al show that the nodes near the base station handle more number of packets than those situated away from the base station and hence can be identified as important nodes by an adversary. This helps him to move closer to the base station. Various methods are described viz. "Multi-parent routing scheme", "random walk" and "fractal propagation" which randomize the packet routes, prevent traffic analysis attack and also prevent the adversary from locating the base station or the source node.

III. THE SOURCE LOCATION PRIVACY SCHEME

The proposed SLP scheme is designed for the sensor network which is similar to the generic sensor-network application, called the "Panda-Hunter Game" in [1]. Here the sensor nodes continuously monitor the area of interest and report the presence of specific entities within its sensing range. There is an adversary trying to get the location information of those entities. The sensor nodes remain static after their random deployment. The sensing capabilities of the adversary are similar to that of the WSN nodes.

3.1. The model of the SLP scheme

The privacy scheme is implemented in two phases: The cluster based anonymization phase and the random routing phase. In the first phase the nodes are randomly deployed initially. The area to be sensed is divided into equal partitions with the number of partitions being fixed at five. Each partition represents a cluster. The process of clustering uses distance as a clustering criterion. All nodes lying within the boundary of a particular partition form a cluster and choose their cluster head (CH) randomly. The CH implements the anonymization mechanism by assigning random number to a node which needs to transmit event related information. The node then replaces its real identity with this number and then transmits its message. The mapping of, which node has been assigned which random number as the node identity is available with the cluster head. In case an adversary is able to read the message header he only gets to know the fake Identity number and not the real one. Thus this scheme prevents the Correlation-based source node identification attacks described in [6].

The primary aim of the second phase i.e. random routing is to hide the source location of the transmitting node so that the adversary is not able to detect which node started the transmission after generation of the desired event. Therefore the cluster heads after receiving the data from their respective source nodes forward the data to a randomly chosen node. Based on a random number of hops, each node forwards the data to another random node, thus forming a logical link across the network. Then finally one of the link nodes transmits it to the base station. The blending of source location information of the transmitting node with the network traffic is thus achieved and the location of the transmitting node gets diffused.

3.2. The analysis of the SLP scheme

In this section we introduce and define the various parameters associated with the SLP Scheme.

The degree of privacy: The degree of privacy $(DoP)_A$ contributed by the anonymization phase is defined as a percentage of the maximum Privacy.

The maximum privacy occurs when the adversary is not able to pin point the location of the source node and any one of the total nodes present in the WSN can be the probable source nodes. It is measured by using entropy based method described in [7], [8].

The $(DoP)_A$ is calculated as follows:

$$(DoP)_A = E_S / E_{MAX} \quad (1)$$

Where,

$$E_{MAX} = -\sum_{i=1}^{N} \frac{1}{N} * \log_2 (\frac{1}{N}) = \log_2 N$$

$$E_S = -\sum_{i=1}^{Ns} \frac{1}{Ns} * \log_2 (\frac{1}{Ns}) = \log_2 Ns$$

N= Total no. of sensor nodes in WSN

N_S = No. of nodes in the sensed area

Degree of Disclosure: Degree of Disclosure is defined as the amount of location information that one message is able to disclose to the adversary.

If the routing path is fixed then it is possible for an adversary to backtrack to the source node as the location information of each node on the routing path becomes known to the adversary due to fixed correlation between

node location and its identity. For a fixed path of length L hops, the Degree of Disclosure (DoD) will be given by (2)

$$DoD = (1/L) \quad (2)$$

If there is n number of fixed paths each having length L_1, L_2, L_3.....Ln then DoD will be computed as in [8] and given by (3)

$$DoD = (1/\{ L_1 + L_2 + L_3 + ...Ln \}) \quad (3)$$

The degree of privacy due to routing, $(DoP)_R$ is given by (4)

$$(DoP)_R = 1\text{-}DoD \quad (4)$$

Here 1 is taken as the value for maximum privacy when no message leaks any kind of location information to the adversary.

The Privacy Measure Index (PMI) describes the overall privacy achieved by the SLP scheme and is defined as the average privacy achieved as a result of anonymization and random routing. Thus PMI is given by (5).

$$PMI = [(DoP)_A + (DoP)_R] / 2 \quad (5)$$

IV. SIMULATION RESULTS

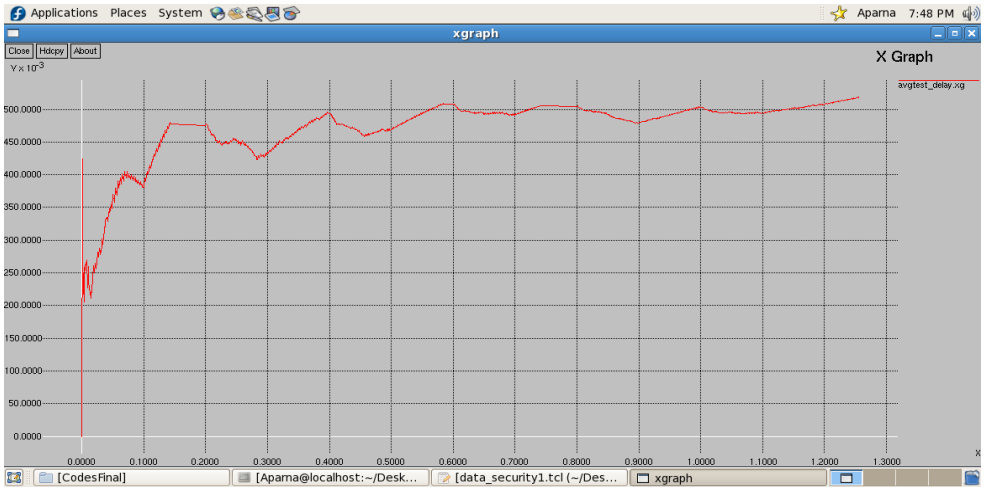

Figure1. Average end to end message delay

TABLE1. Calculating privacy measure index (PMI)

No. of Nodes	Affected nodes	E_S	E_{MAX}	Degree of Privacy $(DoP)_A = (E_S/E_{MAX})$	% Average $(DoP)_A$	No. of Hops from Source to Sink	Degree of Disclosure (DoD) for fixed path	Degree of Disclosure (DoD) for n disjoint fixed path n=4	Degree of Privacy $(DoP)_R$ - 1-DoD	Privacy Measure Index (PMI)
50	3	1.585	5.644	0.281	18.5%	7	0.142	1/27=.037 or 3.7%	96.3%	57.4%
	1	0		0		5	0.2			
	3	1.585		0.281		5	0.2			
	2	1		0.177		10	0.1			
100	4	2	6.644	0.301	20.9%	6	0.167	1/27=0.037 or 3.7%	96.3%	58.6%
	2	1		0.150		9	0.111			
	2	1		0.150		10	0.1			
	3	1.585		0.238		2	0.5			
200	6	2.585	7.644	0.338	31.4%	4	0.25	1/30 =.033 or 3.33%	96.7%	64.05 %
	5	2.322		0.304		8	0.125			
	2	1		0.131		9	0.111			
	13	3.701		0.484		9	0.111			
400	15	3.907	8.644	0.452	44.3%	6	0.167	1/25=0.04 Or 4.0%	96%	70.15 %
	13	3.701		0.428		8	0.125			
	14	3.807		0.440		4	0.25			
	15	3.907		0.452		7	0.143			

The following analysis can be done from values of TABLE 1

- The simulation was done for 4 random node configurations of 50,100, 200 and 400 nodes
- The value of maximum entropy E_{MAX} increased from 5.644 to 8.644
- The % average degree of privacy due to anonymization $(DoP)_A$ increased from 18.5% to 44.3%
  - This happens because the anonymity set for the adversary increases with increase in node density. Due to anonymization the real ID of the node is replaced by a randomly generated pseudo-identity. So, even if the adversary finds out the source ID by reading the header information of the nodes in his sensing area, he cannot find source correctly because he gets to know only the pseudo-identity number which is not linked with source location.
- Four random paths were considered for message transmission from source to sink for each configuration
- The degree of disclosure in case of fixed path routing was more than values obtained for 4 disjoint fixed paths
  - The value of (DoP) routing increases due to the increase in number of routing paths (fixed at four, in this case) and their path lengths.
  - For random routing, as the number of possible independent disjoint paths increases infinitely the (DoP) routing can effectively be considered as 1(In this case the messages leak negligible source location information)
- The degree of privacy due to routing $(DoP)_R$ remained more or less constant at a high value of around 96%
- The Privacy Measure Index increased from 57.4% to 70.15%

Fig 1 shows the plot of average end to end delay in seconds for all received messages on the Y-axis along with the event time stamp on the X-axis. Initially the delay is less, after that it increases within a short period of time and finally stabilizes to almost constant value for the rest of the transmission period. The average message delay was measured as 0.5 msec. There is an increase in average end to end message delay by a factor of 10, compared to a scheme which does not implement SLP. This is expected as the concept of shortest path, which is implemented in most routing algorithms, is not adhered to in this scheme, in order to diffuse the source location information.

V. CONCLUSION

This SLP scheme is effectively able to maintain the location privacy of the transmitting nodes using anonymization and routing technique and gives high degree of privacy values as seen by the simulation results. There is degradation in network performance in terms of end to end message delay, which is acceptable if the requirement of privacy protection is of paramount importance for the sensor network application. This scheme also prolongs network life time as it does not use the computationally intensive process of encryption.

REFERENCES

[1] Source-Location Privacy in Energy-Constrained Sensor Network Routing Celal Ozturk, Yanyong Zhang, Wade Trappe *SASN'04, October 25, 2004, Washington, DC, USA. Copyright 2004 ACM 1-58113-972-1/04/0010*

[2] An Experimental Comparison of Source Location Privacy Methods for Power Optimization in WSNs Guillermo Suarez-Tangil, Esther Palomar, Benjamin Ramos, Arturo Ribagorda *in Advances in sensors, signals and materials, ISSN: 1792-6211 / ISSN: 1792-6238, ISBN: 978-960-474-248-6*

[3] Random data Perturbation Techniques and Privacy Preserving Data Mining Hillol Kargupta, Souptik Datta *Extended version of paper presented in 2003 IEEE International Conference on Data Mining*

[4] Xiaoxin Wu,"Applying Pseudonimity for Anonymous Data Delivery in Location-Aware Mobile *Ad Hoc* Networks" *IEEE Transactions on Vehicular Technology, Vol. 55 NO. 3, May 2006*

[5] DecorrelatingWireless Sensor Network Traffic To Inhibit Traffic Analysis Attacks Jing Deng Richard Han Shivakant Mishra *Elsevier Pervasive and Mobile Computing Journal, Special Issue on Security in Wireless Mobile Computing Systems, vol 2, issue 2, April 2006, pp. 159-186*

[6] Yun Li, Jian Ren, and Jie Wu, "Quantitative Measurement and Design of Source-Location Privacy Schemes for Wireless Sensor Networks" *IEEE Transactions on Parallel and Distributed Systems, Vol. 23, No. 7, July 2012*

[7] Towards an information theoretic metric for anonymity Andrei Serjantov, George Danezis

[8] Source-Location Privacy in Wireless Sensor Networks Song-Woo Lee, Young-Hun Park, Ju-Hyung Son, Seung-Woo Seo, U Kang, Ho-Kun Moon, and Myoung-Soo Lee *Korea Institute of Information Security and Cryptology Journal 2007*

[9] Wireless Sensor Network Security: A Survey John Paul Walters, Zhengqiang Liang, Weisong Shi, and Vipin Chaudhary in Security in Distributed, Grid, and Pervasive Computing Yang Xiao,(Eds.) pp. 2006 Auerbach Publications, CRC Press

[10] Protecting Location Privacy in Large-Scale Wireless Sensor Networks Lei Kang ICC 2009 proceedings

Work Done on Avoidance of Bottleneck in PCS Network

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ABSTRACT
This paper contains work done on avoiding the bottleneck from network using some formulas and techniques that we have surveyed and studied. This is done by replicating the primary copy of HLR at same level which provide all services of primary HLR when it is not in serving mode. Also we have analyzed its performance and drawn results on this basis.

KEYWORDS*: PCS, Location Management, HLR-VLR, Replicated databases, mobile computing.*

I. INTRODUCTION

We studied the various replication techniques to replicate HLR in PCS network. Replication is the key strategy for improving reliability, fault tolerance and availability in Distributed System. Personal Communication Service (PCS) network is the integration of cellular Network and conventional wired network. To support user mobility, the locations of the mobile stations (MSs) should be constantly tracked using a database. The widespread deployment of PCS will lead to a tremendous increase in the number of updates and queries to the location database. The centralized, stand-alone Home Location Register (HLR) in GSM can be a potential bottleneck. In case of the location database failure, incoming calls may be lost. According to the analysis of the load in HLR, we suggest replicating the HLR in order to increase its capacity and reliability. We compare all the replication strategies in order to maintain availability, consistency and fault-tolerance in PCS Network to avoid bottleneck.

1.1. Multi HLR Architecture Scheme in PCS Network:

In conventional HLR-VLR scheme, De-registration of a Mobile Terminal from a Visitor Location Register is always explicit. Explicit in the sense that stale entries of Visitor Location Register s are removed with the help of Home Location Register. Actually Home Location Register sends De-registration message to the Visitor Location Register to remove the stale entries when a Mobile Terminal changes its Visitor Location Register. This explicit De-registration increases the total cost by increasing the traffic load. To reduce the traffic load following De-registration strategies were proposed [2].

(A) Distance Based De-registration Scheme.
(B) Time-Based De-registration Scheme.
(C) Polling-Based De-registration Scheme.
(D) Group De-registration Scheme.
(E) Movement-Based De-registration Scheme.

In the proposed architecture, we have several HLRs zone wise or circle wise instead of a single Home Location Register. It reduces the storage overhead of the Home Location Register. Each Home Location Register can serve more than one Visitor Location Register and each Visitor Location Register can serve more than one RAs. Simply we can say that this architecture contains several conventional HLR-VLR architectures.

II. PERFORMANCE ANALYSIS OF MULTI HLR ARCHITECTURE:

An analytical model to evaluate the performance of multi HLR architecture has been presented here along with the group de-registration strategy implemented in same architecture. Here all HLRs are located at the same layer and they are communicating each other in point-to-point basis. In this analysis, hierarchal trees of R layers are being used. The layer R contains the roots of all trees and leaves of all trees are at the level 1. It means both roots and leaves reside on the same layer.
Following terms are being used in the performance analysis:-

$\mathbf{m_{x,y}}$ Layer of the closest common node to RA x and RA y.
p Probability that the MT move is intra-VLR.

n New RA of the MT.
a Old RA of the MT.
P ($m_{x,y}$=i) is defined as the probability that the closest common node to LA x (RA x) and LA y(RA y) is in layer i. This probability can be given by the following equation.

$$P_{m(a,n)} = p(1-p)^{i-1}) \; for \; i = 1, 2, \ldots\ldots R-1$$
$$(1-p)^{i-1} \; for \; i = R \ldots\ldots\ldots\ldots (1)$$

We furthermore denote the costs of various operations used in this analysis as follows:
T (i, j): Cost of transmitting a message over a link between two adjacent layers i and j.
Cm (i): Cost of accessing or updating a database in layer i.
$M_{multi\ HLR\text{-}VLR(explicit)}$: Estimated cost of a location update in the explicit multi HLR-VLR scheme.

$M_{mutiHLR\text{-}VLR\ (group)}$: Estimated cost of a location update using group de-registration scheme in multi HLR-VLR architecture.

Estimated cost of location update in explicit stand alone HLR-VLR scheme is given as:

$$M_{HLR-VLR(explicit)} = \left[P(m_{a,n} = 1) \times C_m(1) + 1\right] + \sum_{i=2}^{R} P(m_{a,i} = i) \times \{2 \times C_m(1) + C_m(R) + 4T(1,R)\} \ldots . (2)$$

The first part of Eq. (2) is the cost of location update in intra-VLR move. The second part illustrates the scenario after an inter-VLR move. T (1, L) =T (1, 2) +T (2, 3) +……..+T (L-1, L) is equal to the cost of traversing links between a node of layer 1(i.e., VLR) and the node of layer R (i.e., where an HLR is located). This cost is multiplied by 4 because new VLR sends registration request to the HLR, the latter sends cancellation request to the old VLR, old VLR sends an acknowledgement in response to the HLR and finally HLR confirms the registration of new MT at the new VLR.
Transmission cost of the message is described as follows:

T(1,L)=T(1,2)+T(2,3)+……..+T(L-1,L)

T (1, 2) will give the result 2; T (2, 3) will give the result 3 and so on.

Estimated cost of location update with group de-registration scheme is given as follows:

$$M_{HLR-VLR(explicit)} = \left[P(m_{a,n} = 1) \times C_m(1) + 1\right] + \sum_{i=2}^{R} P(m_{a,i} = i) \times \{2 \times C_m(1) + 3 \times C_m(R) + 2T(1,R)\} \ldots . (3)$$

The first part of this Equation number (3) is the cost of location update in intra-VLR move. The second part illustrates the scenario after an intra-VLR move. When an MT leaves its RA and enters into new RA the new VLR sends a registration request to the HLR. HLR keeps the identification of the MT into the OML of the old VLR. After performing the MT's profile update by accessing its database HLR sends the acknowledgement message along with the OML of new VLR. We see that HLR database is being consulted three times. The first access is done for putting the MT's identification into the old VLR's OML, second time for updating the MT's current location information and third time for emptying the OML of new VLR, further the entries of this OML is sent back with the acknowledgement. At the VLR side database is being consulted twice, first for the registration of new MT and second for de-registration of the entries sent by the HLR.

In part 3 of this equation, we are generalizing the movement of an MT when MT leaves its resident-HLR and enters into new serving-HLR and then after it again changes its serving-HLR to another serving-HLR. A cost of 4 is being added to it because of the following reasons: Let an MT leaves its resident-HLR and enters into a serving-HLR say serving-HLR1. Again the same MT leaves this serving-HLR1 and enters into another serving-HLR say serving-HLR2. In registration process of MT in serving-HLR2, it sends location update to

resident-HLR (cost incurred is 1), on reception of this message, resident-HLR updates the location information of MT and sends a location cancellation message to serving-HLR1 (cost incurred is 1). On reception of this message, the serving-HLR1 deletes the location information of this MT. The serving-HLR1 acknowledges the resident-HLR about the location cancellation message (cost incurred is 1). Finally the resident-HLR acknowledges the serving-HLR2 (cost incurred is 1) and location registration takes place at the serving-HLR2. As all HLRs are the same level hence message exchange cost between the two HLRs is T (1, 1) =1.

III. RESULTS

In this section the numerical values of explicit de-registration scheme and group de-registration scheme implemented in the multi HLR-VLR architecture are evaluated and compared. Fig (6) and (7) show the performance of location update schemes with R=5 and R=3 respectively.

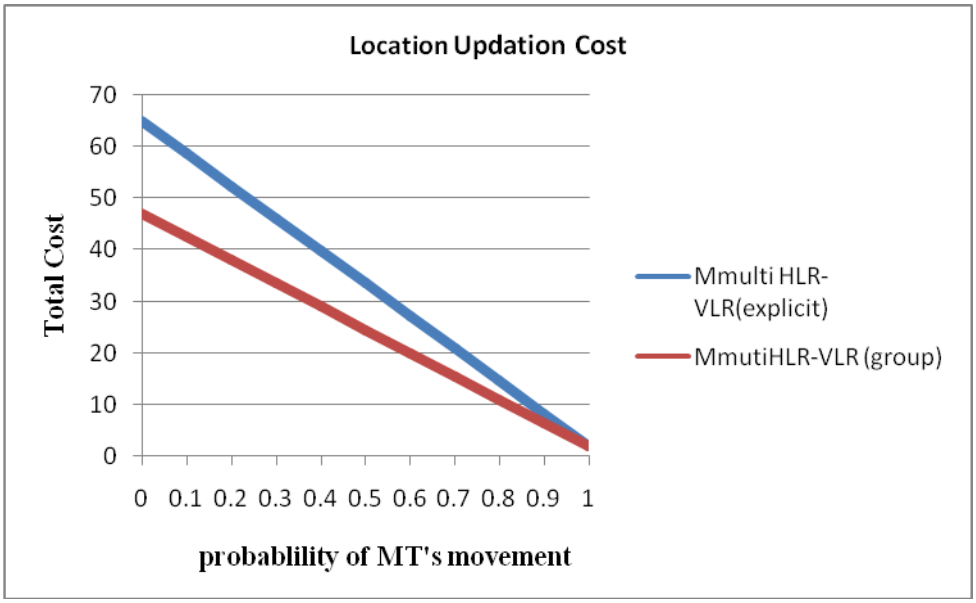

Figure 1: Location update cost for R=5

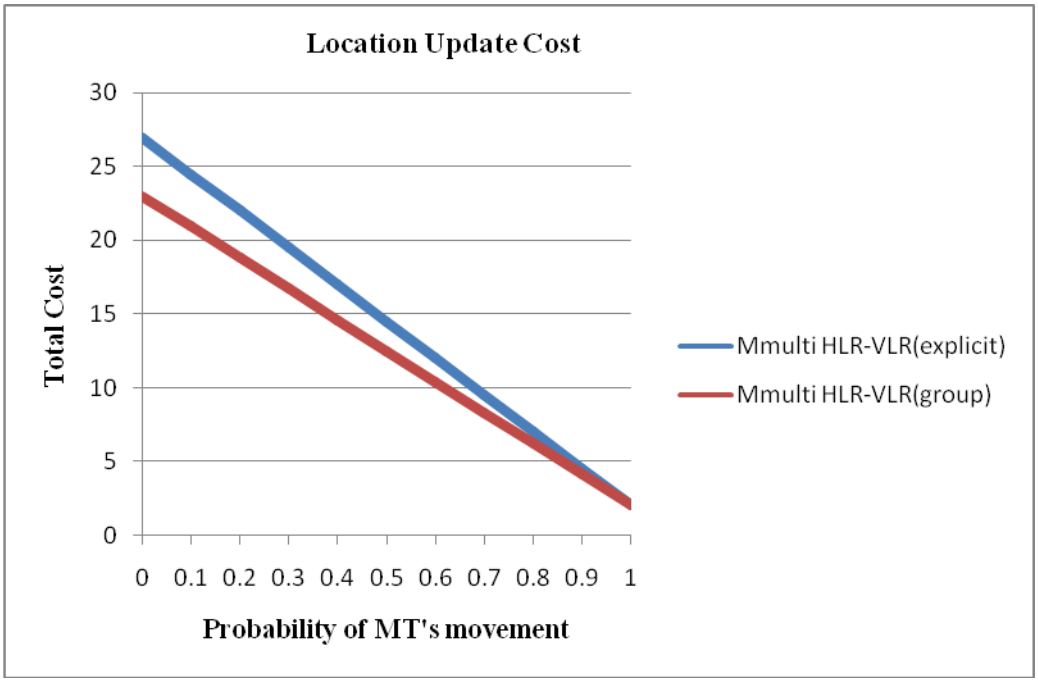

Figure 2: Location update cost when R=3

Probability shows that the MT will reside in its resident-HLR. Probability and indicate that MT will be in serving-HLRs. When has value 1 then MT is not changing its resident-HLR. Probability p defines the MT's intra VLR move. If p equals to 1 then MT is not changing its location. When p tends to 0, it means MT's move is not local. When and p are equal to 1, MT is in its resident-HLR and not changing its location and hence location update cost is 1. When and p equals to 0, it means MT is not in its resident-HLR and its move is not local with respect to serving-HLR. When and p equal to 0, it shows the maximum degree of movement.

IV. CONCLUSION

Conventional architecture has a single HLR and that's why it suffers from call misrouting and bottleneck during peak load. To remove this, several conventional architectures are group together to form multi HLR architecture. In this scheme we store the user profile in HLRs zone wise. This approach reduces the storage load on HLR and hence minimizes the possibility of bottleneck. Now in this architecture even in high load appropriate information is fetched from HLRs and we significantly minimize the possibility of call misrouting.

Analysis done in the last section shows that total cost incurred into the location management in the proposed multi HLR-VLR architecture using group de-registration scheme is efficient than the explicit de-registration scheme. The proposed architecture is free from the problem of bottleneck as we are not entirely relying on one HLR. We have not any stale entry of MT in any VLR as we have associated the de-registration process of the MT with its movement and saved sufficient cost by implementing group de-registration scheme instead of conventional explicit de-registration.

REFERENCES

[1] W.F. Ames. Numerical Methods for Partial Differential Equations. Academic Press, 1977.
[2] R. Aris. Discrete Dynamic Programming. Blaisdel, 1964.
[3] D.R. Bailes and C.J. Taylor. The Use of Symmetry Chords for Expressing Grey Level Constraints. In Proc. British Machine Vision Conference, pages296-305. Springer, 1992.
[4] D.H. Ballard. Generalizing the Hough Transform to Detect Arbitrary Shapes. Pattern Recognition, 13:111-122, 1981.
[5] R. Bellman. Dynamic Programming. Princeton University Press, 1957.
[6] A. Blake and M. Isard. Active Contours. Springer, 1998.
[7] G.J. Borse. Numerical Methods with Matlab. PWS, 1997.
[8] J.P Boyd. Chebyshev and Fouirer Spectral Methods. Springer, 1985.
[9] W. Cheney and D. Kincaid. Numerical Mathematics and Computing. Brook-s/Cole, 1985.
[10] J.H. Chuang. Potential-Based Approach for Shape Matching and Recognition. Pattern Recognition, 29:463-470, 1996.
[11] P.G. Ciarlet and J.L. Lions. Handbook of Numerical Analysis, Volume 5. El-sevier, 1997.
[12] L.D. Cohen. NOTE On Active Contour Models and Balloons. Computer Vision and Image Processing: Image Understanding, 53:211-218, March 1991.

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Data Aggregation Protocols in Wireless Sensor Networks

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ABSTRACT

Past few years have witnessed increased interest in the potential use of wireless sensor networks (WSNs) in a wide range of applications and it has become a hot research area. There is need of for fast data access in WSN, as resource-constrained is a critical issue in Wireless Sensor Networks (WSNs) applications. Routing protocols are in charge of discovering and maintaining the routes in the network. Routing protocols with low energy consumption plays a very important role in prolonging the lifetime of sensor network. Owing to a variety of advantages, clustering is becoming an active branch of routing technology in WSNs. Tree-based and Cluster-based routing protocols have proven to be effective in network topology management, energy minimization, data aggregation and so on. Data Aggregation is the global process of gathering and routing information through a multi hop network, processing data at intermediate nodes with the objective of reducing resource consumption. In this paper, various data centric aggregation techniques is discussed like TAG, EADAT, AGIT, SRTSD and PEDAP protocols under tree based and LEACH, PEGASIS, TEEN, APTEEN and HEED under cluster based approach for WSN. Furthermore this paper gives an overview tree-cluster based routing protocols.

KEYWORDS: Wireless sensor network, Tree-based, Cluster-based, routing protocol, Data aggregation, life time, energy minimization;

I. INTRODUCTION

Wireless sensor networks (WSN) are is special kind ad-hoc network, having abilities of sensing, processing and wireless connectivity. Wireless Sensor Network (WSN) contains hundreds or thousands of sensor nodes have the ability to communicate among each other, have limited energy source, energy constrained and bandwidth. The sensors coordinate among themselves to form a communication network such as a single multi-hop network or a hierarchical organization with several clusters and cluster heads to collect the data to sink node in the WSN. Because of limited computing resources of the sensors presents a major challenges for routing protocols and algorithms. Considerable techniques are required to make them energy efficient that would increase the life-time of a WSN [1][2][3][6].Since sensor nodes are energy constrained, it is inefficient for all the sensors to transmit the data directly to the base station. Data Aggregation is the global process of gathering and routing information through a multi hop network with the objective of reducing resource consumption (in particular energy) and prolong the network lifetime in WSNs [4].

II. DATA AGGREGATION

The main purpose of the data aggregation is to reduce the power consumption by minimizing the number of data transmissions. *Data aggregation* is defined as the process of aggregating the data from multiple sensors to eliminate redundant transmission and provide fused information to the base station. All the aggregation nodes collect data from their children nodes and calculate the aggregation value. Then only the aggregated values are forwarded towards the data sink. The aggregate value may be average, maximum (minimum), summation, etc. which is calculated according to the application requirements. .Data generated from neighboring sensors is often redundant and highly correlated. In addition, the amount of data generated in large sensor networks is usually enormous for the base station to process. Data aggregation usually involves the fusion of data from multiple sensors at intermediate nodes and transmission of the aggregated data to the base station.

The sensors periodically sense the data, process it and transmit it to the base station. The frequency of data reporting and the number of sensors which report data usually depends on the specific application. The efficiency of data aggregation algorithms depends on the correlation among the data generated by different information sources (sensor units). A correlation can be either *spatial* or *temporal*. *Aggregation gain* is defined as the measure of reduction in the communication traffic due to the aggregation. The most important ingredient for aggregation is a well designed routing protocol, classified as *Classic (address centric) routing protocols* typically forward data along the shortest path to the destination and *Data centric routing protocols* forward data based on the packet content and choose the next hop in order to promote in-network aggregation and minimize energy expenditure [4][5][6].

2.1.Classification of Data Aggregation Mechanisms [7]According the WSN, Data aggregation mechanisms can be classified as structure-free, structure-based and hybrid structure. When sensor nodes are randomly deployed in the environment, by nature, they require a structure-free mechanism. When sensor nodes are deployed at a large scale, it becomes difficult in terms of data aggregation and management the WSNs. whereas the structure-based data aggregations are defined with a set of algorithms, which divides the network into groups and/or levels. This group manages separately their data aggregation and reduced view of the entire network. However the structure-based mechanisms require an extra charge to organize the network and to maintain organization during the network lifetime. Hybrid structure combines characteristics of both structure-free and structure-based is depending upon application.

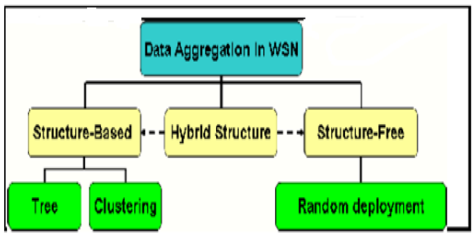

Fig-1 Classification of data aggregation

2.2 Structure-Free Data Aggregation

A WSN is as a multi-hop Ad-Hoc network, where no infrastructure is available to connect the network nodes. The typical communication architecture for a structure-free data aggregation is the basic client/server architecture. To achieve the scalability, it is important to consider several key points such as the high amount of detected data and the communication sessions required to send them to the server. As the sensor nodes are energy constrained, it is inefficient for all the sensors to transmit the data directly to the base station. Because the communication is very expensive in terms of energy compared to the local processing.

2.3 Structure-Based Data Aggregation:

The structures based data aggregation mechanism can be classified as either tree-based or cluster-based.

a) Tree-Based: In a tree-based structure, the sensor nodes are organized into a tree like structure, data aggregation is performed at intermediate nodes along the tree.In the tree-based approach, aggregation is achieved by constructing an aggregation tree, which could be a minimum spanning tree, rooted at sink and source nodes are considered as leaves. Each node has a parent node to forward its data. Flow of data starts from leaves nodes up to the sink and there in the aggregation done by parent nodes shown in figure-2.

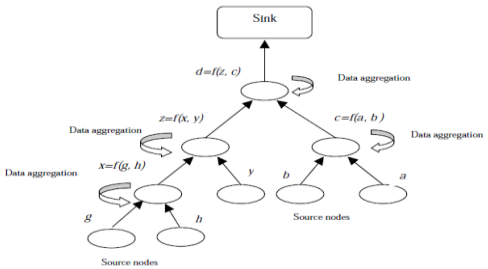

Fig-2

b) Cluster-Based: In a cluster-based structure, the network is partitioned into subgroups. Each subgroup is called cluster. In each cluster, there are several sensor nodes in which a node is assigned as a "cluster head" (CH) as in figure-3. The CHs are designated to send their cluster nodes data to the sink. A CH is usually the master and the sensor nodes are slaves, this master/slave mechanism allows tight traffic control because no node

is allowed to transmit outside the cluster, and no communication is allowed between slaves except through the master.

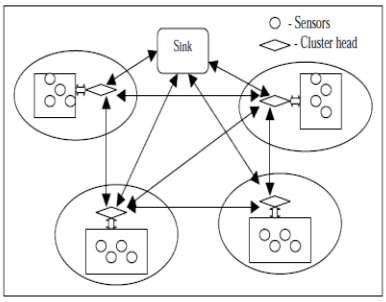

Fig-3

III. DATA AGGREGATION PROTOCOLS

Data aggregation protocols are designed based on network architectures. It is divided into flat, hierarchal and location based protocols. The main objective of data aggregation is to increase the network lifetime by reducing the resource consumption of sensor nodes (such as battery energy and bandwidth). Here, we are mainly focusing on tree-based, cluster-based class of routing protocols [4]. While increasing network lifetime, data aggregation protocols may degrade important quality of service metrics in wireless sensor networks, such as data accuracy, latency, fault-tolerance, and security. Therefore, the design of an efficient data aggregation protocol is an inherently challenging task. Hence, the architecture of the sensor network plays a vital role in the performance of different data aggregation protocols. There are several protocols that allow routing and aggregation of data packets simultaneously [9].

3.1Routing Challenges and Design Issues:

Following are the routing challenges and design issues that affect routing process in WSNs [3, 8, 10]:

- **Node deployment:** Sensor node deployment usually varies with application requirements and affects the performance of routing protocol. The commonly used random or deterministic deployments, some applications may support redeployment of nodes, for instance, to eliminate sensing holes in the network. Inter-sensor communication is normally within short transmission ranges due to energy and bandwidth limitations. Hence, it is most likely that a route will consist of multiple wireless hops.

- **Energy consumption without losing accuracy:** Sensor nodes can use maximum of their limited supply of energy to perform computations and for transmitting the information in a wireless environment. Energy conserving forms of communication and computation are essential, as the Sensor node lifetime is strongly depending on the battery lifetime. In a multihop WSN, each node plays a dual role as data sender as well as data router. The malfunctioning of some sensor nodes due to power failure can cause topological changes and might require rerouting of packets and reorganization of the network.

- **Node/Link Heterogeneity:** Normally all sensor nodes were assumed to be homogeneous, i.e., having equal capacity in terms of computation, communication, and power. However, sensor node can have different role or capability, depending on the application. The existence of this type of sensors (heterogeneous set) raises many technical issues related to data routing. In hierarchical approaches, the protocols designate a cluster head node different from the normal sensors. These cluster heads can be chosen from the deployed sensors or can be more powerful than other sensor nodes in terms of energy, bandwidth, and memory. Hence, the burden of transmission to the Base Station (BS) is handled by the set of cluster-heads.

- **Fault Tolerance:** Some sensor nodes may fail or blocked due to lack of power, physical damage, or environmental interference. The failure of sensor nodes should not affect the overall task of the sensor network. If more numbers of nodes fails, MAC and routing protocols must accommodate formation of new links and routes to the data collection for base stations. This may require actively adjusting transmit powers and signalling rates on the existing links to reduce energy consumption, or rerouting packets through regions of the network where more energy is available. Therefore, multiple levels of redundancy may be needed in a fault-tolerant sensor network.

- **Coverage:** can cover a limited physical area of the environment, because of its limitations in range and accuracy. Hence, it is also an important design parameter in sensor network.
- **Quality of Service, Scalability, Connectivity:** In some applications, data delivery is periodic, data will consider for certain period otherwise become useless. As the energy gets depleted, the network may be required to reduce the quality of the results in order to reduce the energy dissipation in the nodes and lengthen the total network lifetime. Energy-aware routing protocols are required to capture these requirements. The sensing area may be huge in the order of hundreds or thousands, or more sensor nodes. All protocols must work without considering the size of the network. The High node density in sensor networks precludes them from being completely isolated from each other. Therefore, sensor nodes are expected to be highly connected.

3.3Tree Based Protocols:

Tiny Aggregation TAG [11]: Tiny Aggregation service for ad-hoc sensor networks. It is a data-centric protocol, which is based on a tree structure data aggregation and is specifically designed for monitoring applications. This means that information is collect periodically from all the nodes. TAG consists of two main phases: (1) the distribution phase, where queries are disseminated to the sensors and (2) the collection phase, where the aggregated sensor readings are routed up the aggregation tree. The distribution phase passes by a broadcast message from the sink in order to organize the sensor nodes into a tree. This broadcast message is periodically sent by the sink to keep the tree structure updated regularly.

3.4Energy-Aware Distributed Aggregation Tree EADAT [7, 12]: Energy-Aware distributed heuristic algorithm to construct and maintain a Data Aggregation Tree in WSNs. In which the tree formation is by broadcasting a control message. This message is forwarded among all the sensor nodes until each node broadcasts the message once and the result is an aggregation tree rooted at the base station. After receiving this message for the first time, a sensor nodes set up its timer counts, when its communication channel is idle, sensor node chooses the node with higher residual power and shorter path to the sink as its parent during this process.

3.5Aggregation Efficiency-Aware Greedy Incremental Tree (AGIT) [13]: GIT (Greedy Incremental Tree) routing is a heuristic distributed algorithm to construct a Steiner tree on a hop-count basis and is based on directed diffusion (DD), which is a typical data-centric routings for sensor networks. Routing assumes perfect aggregation. Each source, tries to find the shortest hop from itself to the existing path tree or the sink, one by one. Each exploratory message in GIT routing involves an additional attribute is considered, to realize process. which denotes the additional cost (hop-count) from the source originating itself to the current node. GIT-like routing necessarily distributes exploratory messages in order to determine the aggregation point for the existing path tree. The exploratory message is distributed through the network according to the gradient of the corresponding interest. The message will arrive at nodes on the existing path tree. The AGIT routing, new scheme to suppress the excessive exploratory messages, which can construct a more efficient path tree than the original GIT routing and the opportunistic routing.

3.6.SRTSD (Spanning Routing Tree protocol based on State Diffusion) and SRTSD-DA (SRTSD with Data Aggregation)[4,14] : These protocols ensures the connectivity and to save energy in mobile WSNs. *Routing tree construction* consists of startup phase, diffusion phase and schedule creation phase. In the startup phase, all sensors set their state to be interrupted, but the state of sink is always connected. The sink node broadcasts message to interrupted nodes within the communication range of the sink. Nodes receive the location of sink node from the message. If the distance between the node and the sink is less than the reliable communication distance then the node ID and hop count are added into its connected nodes list (CNL). In *Diffusion phase,* the node traverses the CNL to find the best next hop node with smallest network cost. The diffusion phase continues until all nodes become connected. After diffusion phase, all the *connected* nodes form a tree whose root is sink node. In *Sensed Data Transmission Phase*, the connected sensors transmit sensed data to its next hop. The intermediate nodes receive data and forward the data directly. The SRTSD-DA algorithm is similar to SRTSD algorithm, with small changes of diffusion phase with respect network cost and sensed data transmission phase with respect to intermediate nodes, which can aggregate the data and transmit aggregated data to its next hop.

3.7.Power Efficient Data gathering and Aggregation Protocol (PEDAP)[6,15]: The goal of this is to maximize the lifetime of the network in terms of number of rounds, where each round corresponds to aggregation of data transmitted from different sensor nodes to the sink. PEDAP is a minimum spanning tree based protocol which improves the lifetime of the network even when the sink is inside the field. Prim's

minimum spanning tree algorithm is employed to compute the routing paths with the sink as the root. The data packets are routed to the sink over the edges of the minimum spanning tree. In order to balance the load among the nodes, the residual energy of the nodes should be considered while aggregating the data. The PEDAP protocol requires global knowledge of the location of all nodes at the sink. The protocols operate in a centralized manner where the sink computes the routing information.

3.8Cluster based protocols:

Low-Energy Adaptive Clustering Hierarchy (LEACH)[16,17]:LEACH is an adaptive clustering-based protocol using randomized rotation of cluster-heads to evenly distribute the energy load among the sensor nodes in the network . The data will be collected by cluster heads from the nodes in the cluster and after processing and data aggregation forwards it to base station. The three important features of LEACH are Localized co-ordination and control for cluster setup, Randomized cluster head rotation, Local compression to reduce global data communication

LEACH is divided into five clusters, each cluster has a black circle represents the first cluster node, the rest of the white circle indicates a non cluster head node. Each cluster has a cluster head node, protocol randomly selecting cluster head node cycle, the energy of the entire network load equally distributed to each sensor node can achieve lower energy consumption, the purpose of improving network lifetime

3.9.PEGASIS: PEGASIS (Power-Efficient Gathering in Sensor Information Systems)[18]:It is considered an optimization of the LEACH algorithm. The key idea in PEGASIS is to form a chain among the sensor nodes so that each node will receive from and transmit to a close neighbor. The chain is constructed with a greedy algorithm. It Gathers the data and moves from node to node, eventually a designated node transmits to the Base Station. For a network running PEGASIS, it is required to form a chain that contains all nodes. The chain construction starts with the farthest node from the base station. By using a greedy algorithm, it chooses the second farthest node as its neighbor. Then the third farthest node is chosen as the second farthest nodes other neighbor. This process is repeated until the closest node to the base station is chosen as the other end of the chain. PEGASIS outperforms LEACH by eliminating the overhead of dynamic cluster formation, minimizing the distance non leader-nodes must transmit, limiting the number of transmissions and receives among all nodes, and using only one transmission to the BS per round.

3.10.TEEN: Threshold sensitive Energy Efficient sensor Network (TEEN)[19] is a hierarchical clustering protocol belongs to on-demand routing protocols category and mostly used for time crucial applications. In TEEN, nodes have two levels of cluster heads and also they follow hierarchical clustering design. After nodes have selected their cluster head, user needs to manually enter the attribute values, which will be broadcasted by cluster head in form of two parameters soft threshold and hard threshold.TEEN is a hybrid of hierarchical clustering and data-centric protocols designed for time-critical applications. It is a responsive protocol to sudden changes of some of the attributes observed in the WSN (e.g., temperature, pressure).The algorithm first goes through cluster formation. It enables CHs to impose a constraint on when the sensor should report their sensed data. After the clusters are formed, the CH broadcasts two thresholds to the nodes namely hard threshold (HT), This is a threshold value for the sensed attribute. It is the absolute value of the attribute beyond which, the node sensing this value must switch on its transmitter and report to its cluster head. and Soft threshold (ST) ,This is a small change in the value of the sensed attribute which triggers the node to switch on its transmitter and transmit. It is useful for the applications where the users can control a trade-off between energy efficiency, data accuracy, and response time dynamically.

3.11.Adaptive Periodic Threshold Sensitive Energy Efficient Sensor Network Protocol (APTEEN)[20] :It has been proposed just as an improvement to TEEN in order to overcome its limitations and shortcomings. It mainly focuses on the capturing periodic data collections (LEACH) as well as reacting to time-critical events (TEEN). Thus, APTEEN is a hybrid clustering-based routing protocol that allows the sensor to send their sensed data periodically and react to any sudden change in the value of the sensed attribute by reporting the corresponding values to their CHs. The architecture of APTEEN is same as in TEEN, which uses the concept hierarchical clustering for energy efficient communication between source sensors and the sink. APTEEN guarantees lower energy dissipation and a helps in ensuring a larger number of sensors alive. In this, cluster is formed with 1st level and 2nd level cluster heads. After selecting the cluster head (CH) it receives the attribute from the user. The CH broadcasts the attribute, hard threshold (HT), soft threshold (ST), schedule and count time (CT) parameters to the cluster members. The sensor nodes sense continuously. If the sensed value is above the HT it is stored in the internal variable (SV) and transmitted to the CH through the TDMA schedule assigned for it. All the clusters formed here may not have uniform number of sensor nodes. The cluster formed

with maximum number of nodes requires more time to aggregate the captured data from nodes and transmit to BS than the cluster with minimum number of nodes. APTEEN Guarantees lower energy dissipation, It ensures that a larger number of sensors are alive.

3.12.(Hybrid Energy-Efficient Distributed Clustering(HEED)[21]:HEED is a multi-hop clustering algorithm for wireless sensor networks, with a focus on efficient clustering by proper selection of cluster heads based on the physical distance between nodes. It uses using residual energy as primary parameter and network topology features (e.g. node degree, distances to neighbors) are only used as secondary parameters to break tie between candidate cluster heads, as a metric for cluster selection to achieve load balancing. In this all nodes are assumed to be homogenous i.e. all sensor nodes are equipped with same initial energy. The node population is equipped with more energy than the rest of the nodes in the same network , this is the case of heterogeneous sensor networks. As the lifetime of sensor networks is limited there is a need to re-energize the sensor network by adding more nodes.The main objectives of HEED are to Distribute energy consumption to prolong network lifetime, Minimize energy during the cluster head selection phase, Minimize the control overhead of the network. Cluster heads are determined based on two important parameters; The residual energy of each node is used to probabilistically choose the initial set of cluster heads. This parameter is commonly used in many other clustering schemes. Intra-Cluster Communication Cost is used by nodes to determine the cluster to join. This is especially useful if a given node falls within the range of more than one cluster head.

Hierarchal Protocols	Type of Network	Energy Consumption	Aggregation	Scalability
PEDAP	Ad-hoc Network	Low	Yes	Limited
TAG	Ad-hoc Network	Low	Yes	Good
AGIT	Ad-hoc Network	Low	Yes	Limited
SRTSD,SRSTD-DA	Mobile sensor network	High	Yes	Good
EADAT	Ad-hoc Network	Low	Yes	Limited
LEACH	Ad-hoc Network	High	Yes	Good
TEEN	Ad-hoc Network	High	Yes	Good
APTEEN	Ad-hoc Network	High	Yes	Good
PEGASIS	Ad-hoc Network	High	No	Good
HEED	Ad-hoc Network	Moderate	Yes	Limited

Fig 4 Comparison of routing protocols

IV. CONCLUSION:

Data aggregation is one of the key techniques to solve the resource-constrained problem in WSN. WSN routing protocols with purpose to find the path to save energy and establish reliable data transfer method from source to destination. This paper presents an overview of different aggregation mechanisms, in tree based and cluster based routing protocols for wireless sensor networks when energy consumption and scalability is considered. There are still many problems need to be considered how to construct the aggregation tree for wireless sensor networks to maximize the life time. Survey of existing protocols was discussed in cluster based and tree based routing protocols in wireless sensor network, all of them need low processing and memory for routing that means lower energy requirements. However the selection of the protocols entirely depends upon the requirements of the application.

REFERENCES:

[1] Wen-Wen Huang, Ya-Li Peng,Jian Wen, Min Yu, "Energy-Efficient Multi-hop Hierarchical Routing Protocol for Wireless Sensor Networks", 2009 International Conference on Networks Security, Wireless Communications and Trusted Computing.

[2] Abid Ali Minhas, Fazl-e-Hadi, Danish Sattar, KashifMustaq and S. Ali Rizvi," Energy efficient Multicast Routing Protocols for Wireless Sensor Networks".

[3] Jamal N. Al-Karaki, Ahmed E. Kamal," Routing Techniques in Wireless Sensor networks: A Survey".

[4] V. Akila1, Dr. T. Sheela," Overview of Data Aggregation Based Routing Protocols in Wireless Sensor Networks", 2013 International Journal of Emerging Technology and Advanced Engineering.

[5] Bhaskar Krishnamachari, Deborah Estrin, Stephen Wicker,"The Impact of Data Aggregation in Wireless Sensor Networks".

[6] Ramesh Rajagopalan, Pramod K. Varshney,"Data aggregation techniques in sensor networks: A Surevy" 2006,Electrical Engineering and Computer Science.

[7] Ahmad Sardouk1, Leila Merghem-Boulahia,"Data Aggregation in WSNS:A survey" 2010 Nova publishers.

[8] Xuxun Liu," A Survey on Clustering Routing Protocols in Wireless Sensor Networks", ISSN 1424-8220, www.mdpi.com/journals/sensors.

[9] Xin Li, ShuBo Qiu," Research on Multicast Routing Protocol in Wireless Sensor Network"2011 IEEE.

[10] Jamal N. Al-Karaki, Ahmed E. Kamal," Routing Techniques in Wireless Sensor Networks: A Survey"

[11] Samuel Madden, Michael J. Franklin, and Joseph M. Hellerstein," TAG: a Tiny AGgregation Service for Ad-Hoc Sensor Networks", 5th Annual Symposium on Operating Systems Design and Implementation (OSDI). December, 2002.

[12] Min Ding, Xiuzhen Cheng, Guoliang Xue "Aggregation Tree Construction in Sensor Networks" 2003 IEEE.

[13] Takafumi Aonishi, Takashi Matsuda, Shinji Mikami, Hiroshi Kawaguchi, Chikara Ohta, Masahiko Yoshimoto," Impact of Aggregation Efficiency on GIT Routing for Wireless Sensor Networks" 2006 International Conference on Parallel Processing Workshops.

[14] Wei Xing, Kuntai Li, Yongchao Wang, Wen Zhou,"A Spanning Routing Tree Protocol Based on State Diffusion for Mobile Sensor Networks",2011 IEEE.
[15] Huseyin O zgur Tan and I˙brahim Korpeoglu," Power Efficient Data Gathering and Aggregation in Wireless Sensor Networks".
[16] Chunjuan Wei, Junjie Yang, Yanjie Gao, Zhimei Zhang," Cluster-based Routing Protocols in Wireless Sensor Networks: A Survey", 2011 International Conference on Computer Science and Network Technology.
[17] Wendi Rabiner Heinzelman, Anantha Chandrakasan, and Hari Balakrishnan," Energy-Efficient Communication Protocol forWireless Microsensor Networks", Proceedings of the 33rd Hawaii International Conference on System Sciences – 2000.
[18] Stephanie Lmdsey and Cauligi **S.** Raghavendra," PEGASIS: Power-Efficient GAthering in Sensor Information Systems".
[19] Arati Manjeshwar and Dharma P. Agrawal," TEEN: A Routing Protocol for Enhanced Efficiency in Wireless Sensor Networks".
[20] Arati Manjeshwar and Dharma P. Agrawal," APTEEN: A Hybrid Protocol for Efficient Routing and Comprehensive Information Retrieval in Wireless Sensor Networks".
[21] Harneet Kour, Ajay K. Sharma,"Hybrid Energy Efficient Distributed Protocol for Heterogeneous Wireless Sensor Network",2010International Journal of Computer Applications.

Development of Virtual Backbone Scheduling Technique with Clustering For Faster Data Collection in Wireless Sensor Networks

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ABSTRACT

Wireless Sensor Networks (WSNs) dominated in last two decades and it is consider as a key technology for various applications that involve lengthy processing and minimum cost monitoring, such as Battlefield Reconnaissance, Building Inspection, Security Surveillance and etc. In most WSNs, the battery is the important energy source of the sensor node. These nodes are expected to work based on batteries for continuous period times like several months or even for few years without replacing. Thus, energy efficiency becomes a critical issue in WSNs. The main objective of a sensor network is often to send the sensing data from all sensor nodes to a common sink node and then perform further analysis at the sink node. Thus, data collection process is one of the important services used in WSNs applications. In the existing techniques, different approaches have been used to sensible simulation models under the set of sensor nodes to common sink communication process known as convergecast. In the TDMA scheduling technique, it is time scheduling process based on a single frequency channel with the aim of reducing the number of time slots required (schedule length) to complete a converge cast. By using this scheduling mechanism, the data collection is higher than previous mechanisms. However, from our experimental results, this Project Work is realized that the TDMA Scheduler unable to collect data from large Sensor Networks. This is the major identified problem. To address this issue, this Project Work proposed an efficient Virtual Backbone Scheduling (VBS) Technique. Along with scheduling mechanism if we use clustering technique which will increase the life time of Wireless Sensors. To overcome this technique a novel Fuzzy Logic based approach has been introduced which will reduce the complexity of mathematical model. So, that the scheduling process can be done in faster way and which will optimize the life time of WSN. In this project work along with Virtual Backbone scheduling, the Clustering mechanism and Fuzzy Logic based approach will optimize the performance of WSN in terms of Optimized Scheduling, Faster Accessing and Faster calculations.Index Terms- Wireless Sensor Networks (WSNs), Time Division Multiple Access, Virtual Backbone Scheduling, Clustering, Convergecast , Fuzzy Logic,Tree Based Routing

I. INTRODUCTION

In Wireless Sensor Networks the data collection is one of the most important process, which is used in many applications. In WSNs set of sensor nodes and the common sink nodes are present which is communicate together. The communication from set of sensor nodes to common sink node process is called convergecast. Each sensor nodes having separate battery source, these battery energy can be used as efficient manner.

For efficient use of energy the data collection process cab be scheduled, In Wireless Sensor Networks Various scheduling process has been used. One of the most important scheduling process is (TDMA) Time Division Multiple Access. The TDMA scheduling is based on Time slots, but the TDMA scheduler cannot used for larger Sensor Networks .To overcome ,In this paper we Proposed a technique called Virtual Backbone Scheduling with fuzzy based clustering process.

II. RELATED WORK

Virtual Backbone Scheduling (VBS) [1][2], is a novel based algorithm that enables fine-grained sleepscheduling.VBS schedules multiple overlapped backbones[4] so that the network energy consumption is evenly distributed among all sensor nodes. In this scheduling VBS, is a set of backbones which will work sequentially [6] in each round. Formally, The Backbone Scheduling consists of two constraints.

Cluster-based design is one of the approaches to conserve the energy of the sensor devices since only some nodes, called cluster heads (CHs) [9][11], are allowed to communicate with the base station[5]. The CHs collect the data sent by each node in that cluster[7], compress it, and then transmit the aggregated data to the common sink. The representative design is low-energy adaptive clustering hierarchy (LEACH) [3] protocol which uses a pure probabilistic model to select CHs [10] and rotates the CHs periodically in order to balance energy consumption. However, in some cases, inefficient CHs can be selected. Because LEACH depends on only a probabilistic model, some cluster heads may be very close [8] each other and can be located in the edge of WSNs. These inefficient cluster heads could not maximize the energy efficiency. Appropriate cluster-head selection can significantly reduce energy consumption and prolong the lifetime of WSNs. Some of the clustering algorithms employ fuzzy logic to handle inconclusiveness in WSNs. Generally, fuzzy [3] [12] clustering algorithms use fuzzy logic for blending different clustering parameters to select cluster heads. To overcome the defects of LEACH, G [9] proposed to use three fuzzy descriptors (residual energy, concentration, and centrality) during the cluster-head selection.

III. PROPOSED SYSTEM ARCHITECTURE FOR VBS WITH FUZZY AND CLUSTERING TECHNIQUE

The architecture representation is shown as figure 1 . It consists of a common sink node and three clusters. Each cluster having a set of sensor nodes and cluster head, which will communicate with sink node . In fig. 1 shows that the CH1 and CH3 performing data collection process while the CH2 turns off its Radio. It will saves the energy of the WSNs battery.

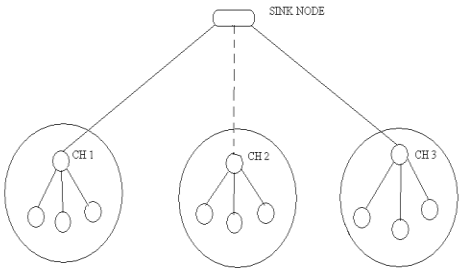

Fig. 1 System Architecture For VBS With Fuzzy and Clustering

IV. PROPOSED ALGORITHMS

In this paper Virtual Backbone Scheduling algorithm and Fuzzy Based Clustering algorithms are used.

A. VBS algorithm

In VBS algorithm it is based on Sleep Scheduling Process. In VBS, Backbone Scheduling (BS), the sensor nodes turns off its radio dynamically to save the energy of its battery. In Backbone Scheduling the sensor nodes which are present in the WSN will forward messages, which forms a backbone, the remaining sensor nodes turn off their radio to save energy of the battery.

B. Clustering

In clustering technique sensor nodes are divided into some groups, which are present in the network. Each groups having separate cluster head. In clustering nodes organized themselves into separate groups called clusters with in each cluster all nodes can communicate with each other. The information has to be forwarded to Cluster Head and in turn the cluster Head will forward the information to the nodes present in the cluster. So that the energy of each node will be saved, which will increase the life time of each node.In this paper LEACH, clustering method configures clusters in every round. In every clustering round each sensor node generates a random number between 0 and 1. If the random number for a particular node is bigger than a predefined threshold *T(n)*, which is the percentage of the desired tentative CHs, the node becomes a CH candidate. The threshold set can be calculated by using the following formula

$$T(n) = P/1 - P * \left(r \bmod \frac{1}{p}\right) \quad if\ n \in G$$

$$T(n) = 0 \quad else$$

Where P is the probability of cluster-head, r is the number of the present round and G is the group of nodes that have not been cluster-heads in the last 1/P round

C. Fuzzy Logic

To improve the performance of the WSN in this project a novel Fuzzy Logic based approach has been used. The advantage of Fuzzy logic compare to the existing mathematical model is it takes less time for calculation rather than mathematical model.In fuzzy Logic fuzzy inference systems (FIS) is used for computation of each node. Fuzzy logic control FIS consists of a fuzzifier, fuzzy rules, fuzzy inference engine, and a defuzzifier. In FIS two input variables for the FIS are the residual energy $E_{residual}$ and the expected residual energy $E_{expResidual}$, and one output parameter is the probability of a node to be selected as a CH, named chance. The bigger chance means that the node has more chance to be a CH.

$$E_{expResidual}(l, d_{toBS}, n) = E_{residual} - E_{expConsumed}$$

Where l is the data size , d_{toBS} is the distance and the n is the neighbor node .

V. IMPLEMENTATION AND RESULTS

In our implementation process we used the reconfigurable emulator for execution .The implementation window Shows in Fig. 2 ,the form with the labels like Number of Nodes, Node ID, State, Range, Elapsed Nodes, Forced Nodes and buttons such as launch, set, Enable clustering , Disable clustering start, report, graph, Exit.

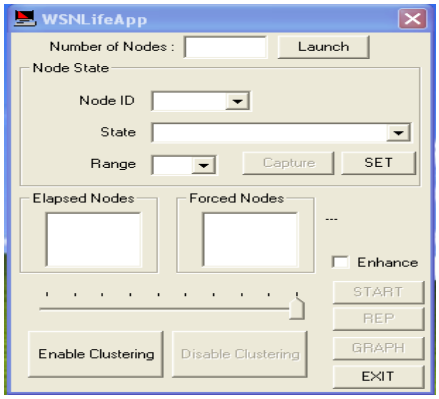

Fig. 2 Initial Window

In the number of nodes label we have to set the total number of nodes wants to launch, then the nodes can be launched, where 7 nodes has been launched .After launching the nodes it can shows different sensor nodes which is shown in Fig. 3. It can be represented as nodes launched successfully.

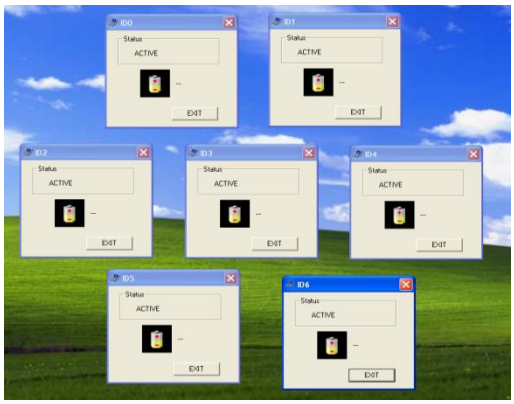

Fig. 3 Launched Nodes

A. Node State

The Form Node ID Label is used to choose various nodes ID which node we need to select its state. In the state label it consist of various states like,

1. Active
2. Transceive
3. Transmit
4. Receive

B. Clustering

In the form there are two buttons are available, these are Enable Clustering and Disable Clustering process. By selecting the enable clustering the fuzzy and clustering process are enabled . It can be shown in the Fig.4

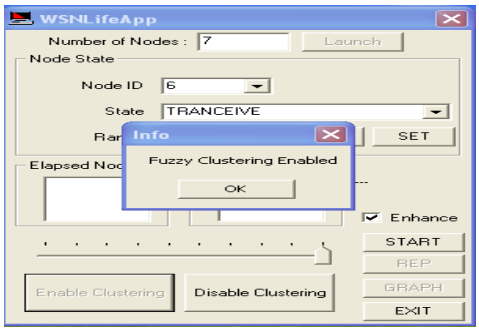

Fig. 4 Fuzzy and Clustering Enable process

C. Execution

For execution we can select the start button once we select the start button the execution process will start. While, processing the battery source can be reduced depends on the state of Sensor node which is mentioned above such as transmit, receive, transceive and active. For this processing the transceive node could elapsed earlier after elapsed the work can be transmitted to active or idle node. After completing the execution process each elapsed node work could transmitted to forced node is shown in Fig. 5.

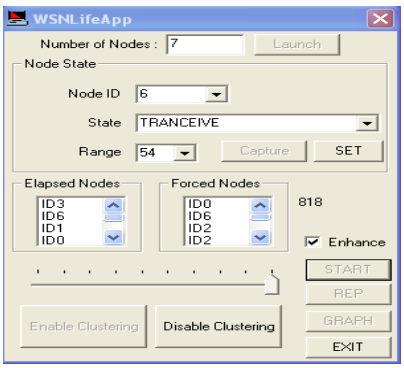

Fig.5 Execution

D. Report

After completing the execution, the report can be generated. The report that can be generated for separate techniques like TDMA, VBS and VBS with Fuzzy and clustering process .Each contains number of nodes, Wireless sensor Networks(WSNs) with stand Duration in hours, Total Data Transfer in KB, Overall Error Rate in Percentage(%), Average Life Time of Sensors in hours, Scheduling Time in ms, these are shown as follow

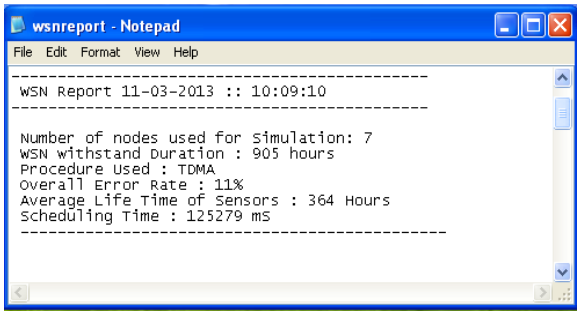

Fig.6 TDMA Report

The TDMA report that has been shown in the Fig. 6 which had the error rate life time of the sensor nodes scheduling time

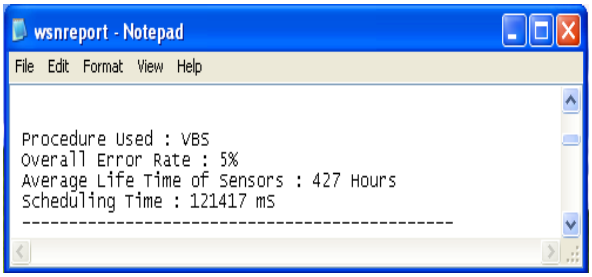

Fig.7 VBS Report

The VBS report that has been shown in the Fig.7 which had the error rate life time of the sensor nodes scheduling time.

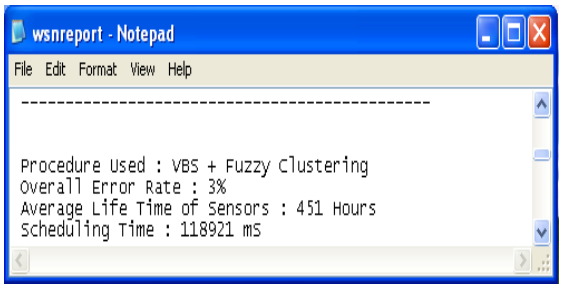

Fig.8 VBS with Fuzzy and clustering Report

The VBS with Fuzzy and clustering report that has been shown in the Fig.8 which had the error rate life time of the sensor nodes scheduling time. By comparing these reports VBS with Fuzzy and clustering process having minimizing error rate , increasing the life time of the sensor nodes and reducing the schedule time which is optimized.

VI. PERFORMANCE ANALYSIS

The result comparisons with existing and proposed graph representations are shown as following sections.

A. Life Time

The Life time comparison is shown in Fig. 9. It Shows that the TDMA Scheduling life time of the sensor node (364 Hrs) , VBS Scheduling life time of the sensor nodes (427 Hrs) and VBS with Fuzzy and clustering Scheduling Life time of the sensor nodes (451 Hrs), which will shows that out proposed VBS with fuzzy and clustering technique will improve the life time of the sensor nodes . It represent the performance of data collection will get increased by using out proposed technique VBS with fuzzy and clustering .

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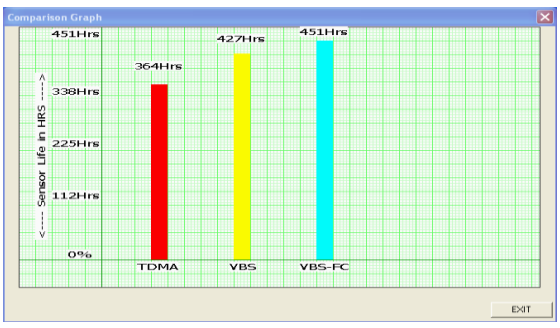

Fig. 9 Sensor Life Time Comparison

B. Scheduling Time

The Scheduling Time comparison is shown in Fig. 10. It Shows that the TDMA Scheduling Time (125279 ms) , VBS Scheduling Time (121417 ms) and VBS with Fuzzy and clustering Scheduling Time (118921 ms), which will shows that out proposed VBS with fuzzy and clustering Schedule time will get decreased . It represent the performance of data collection will get increased by using out proposed technique VBS with fuzzy and clustering.

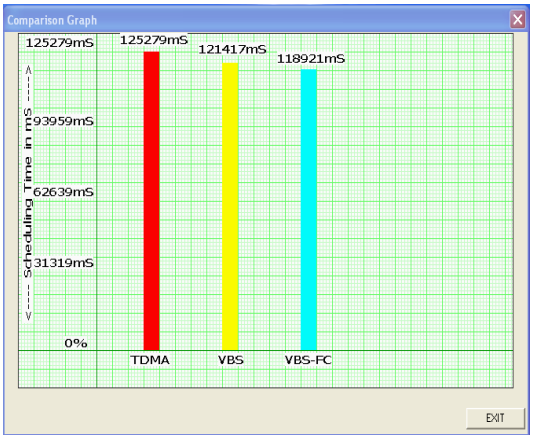

Fig.10 Scheduling Time Comparison

VII. CONCLUSION

We have developed and Implemented Virtual Backbone Scheduling with clustering and fuzzy for Faster Data collection in Wireless Sensor Networks. From our experimental results, it is observed that the proposed work improves the performance of Wireless Sensor Networks in terms of Network Error Rate, Sensor's Lifetime, Communication Cost and Scheduling Time as compared with existing technique. It is also observed that the proposed work improves the performance of Data Collection Process, which saves battery life time and the scheduling time also it will reduce the computational complexity.

REFERENCES

[1] O.D. Incel, A. hoash, et .al.," Fast Data Collection in Tree-Based Wireless Sensor Networks", Mobile computing, vol.11, no.1,pp. 86-99,2012.

[2] Y. Zhao, J. Wu, et .al., "On Maximizing the Lifetime of Wireless Sensor Networks Using Virtual Backbone Scheduling", Parallel And Distributed Systems,Vol.23,No.8,PP. 1528-1535,2012.

[3] J. Eriksson, M .Faloutsos, et.al.," Dynamic Address RouTing for Scalable Ad Hoc and Mesh Networks", IEEE/ACM Transaction On Networking, Vol. 15, NO. 1, Feb, 2007.

[4] G. Zhan, W. Shi, et.al., "Design and Implementation of TARF: A Trust-Aware Routing Framework for WSNs" IEEE Transactions On Dependable And Secure Computing, Vol. 9, No. 2, March/April 2012.

[5] F. Ren, Jiao Zhang, et.al., "EBRP: Energy-Balanced Routing Protocol for Data Gathering in Wireless Sensor Networks" IEEE Transactions On Parallel And Distributed Systems, Vol. 22, No. 12, December 2011.

[6] G. S. Kasbekar, Y. Bejerano, et .al.," Lifetime and Coverage Guarantees Through Distributed Coordinate-Free Sensor Activation" IEEE/ACM Transaction On Networking, Vol. 19, NO. 2, April 2011.

[7] Yang Song, Chi Zhang, et.al., "Minimum Energy Scheduling in Multi-Hop Wireless Networks with Retransmissions" IEEE Transaction On Wireless Communications, Vol. 7, NO. 10, Jan 2010.

[8] J. Kim, X. Lin, et .al.," Minimizing Delay and Maximizing Lifetime for Wireless Sensor Networks With Anycast" IEEE/ACM Transaction On Networking, Vol. 18, NO. 2, April 2010.

[9] S. H. Kang, and T. Nguyen, "Distance Based Thresholds for Cluster Head Selection in Wireless Sensor Networks" IEEE Communications Letters, Vol. 16, NO. 9, September 2012.

[10] M. Saedy, and B. Kelley, "Foundations of Ultra-Low Power Scale Free Sensor Networks for Cluster to Cluster Communications" IEEE Sensors Journal, Vol. 12, NO. 9, September 2012.

Domain Driven Data Mining: An Efficient Solution For IT Management Services On Issues In Ticket Processing

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ABSTRACT

Data Mining is the new emerging technology that can be applied in many real-world problems in order to make the solution. Conventional data mining application faces critical challenges and lack of soft power in solving real-world complex problems when deployed. This data mining is implemented on the IT Infrastructure in order to provide better services. In this aspect, we use a new paradigm shift from 'data-centered knowledge discovery' to 'domain-driven actionable knowledge discovery'. The domain-driven actionable knowledge discovery also termed as Domain-Driven Data Mining, ubiquitous intelligence must be involved and meta-synthesized into the mining process this an actionable knowledge discovery-based problem-solving system is formed as the space for data mining. This is the motivation and aim of developing Domain-Driven Data Mining used for IT Infrastructure Management. In this paper, we propose a methodology to solve the problem raised in the Management of IT Infrastructure. Also, it provides suitable solution for handling the issues raised in the ticket processing. Thus the proposed methodology provides better services to manage the IT services and provide an efficient way to increase the customer satisfaction.

KEYWORDS: *Customer Satisfaction, Data Mining, Domain-Driven Actionable Knowledge Discovery, IT infrastructure, Ticket Processing, Ubiquitous Intelligence.*

1. INTRODUCTION

Information Technology (IT) can be defined as set of tools, processes, and methodologies and associated equipment employed to collect, process and present information. In other terms, IT also includes office automation, multimedia and telecommunications. The methodologies defined include coding, programming, data communications, data conversion, storage and retrieval. In some companies, IT is referred to as Management Information Services (or MIS) or simply as Information Services (or IS). The information technology department of a large company would be responsible for storing information, protecting information, processing the information, transmitting the information as necessary, and later retrieving information as necessary. To perform the complex functions required in the IT field, the modern Information Technology would use many things such as computers, servers, database management systems and cryptography. It would also made up of several System

Administrators, Database Administrators and IT Manager. With the help of these resources, the IT Management Services would be most efficient and powerful. The most popular IT Skills at the moment are:

- Computer Networking
- Information Security
- IT Governance
- Business Intelligence
- Project Management

Information Technology Departments will be increasingly concerned with data storage and management, and will find that information security will continue to be at the top of the list. To lead in this trend this paper focuses the Implementation of Domain Driven Data mining in IT Management service in Order to Provide better efficiency.

Domain Driven Design is a collection of principles and patterns that help developers craft elegant object systems. This can lead to software abstraction called domain models. These models encapsulate complex business logic, closing the gap between business reality and code. It is an approach to develop software for complex needs by connecting the implementation to an evolving model. **Domain** is nothing but a sphere of knowledge, influence or activity. The domain of the software is said to be the area which the user applies a program. In this growing computerized world, data mining has emerged as one of the most essential areas in Information Technology. Many algorithms have been proposed to focus on both domain-independent techniques and specific domain problems. **Domain-Driven Data Mining** aims to develop general principles, methodologies, and techniques for modeling and merging comprehensive domain-related factors and synthesized ubiquitous intelligence surrounding problem domain with the data mining process, and discovering knowledge to support business decision making. In this paper, we implement the Domain-Driven Data Mining in IT Management services in order to reduce the work flow in the organization, and to analysis the issues occurred in the ticket, handling the issues and then fix the issues through proper methodology. These are all proposed in this methodology and it is experimentally verified in order to check for the efficiency of the paper.

II. RELATED WORK

Amir Mosavi et al, paper [1] described that Conventional data mining applications face serious difficulties in solving complex real-life business decision making problems when practically deployed. This work in order to improve the operations in a collection of business domains aims to suggest solutions by reviewing and studying the latest methodological, technical, practical progresses and some cases studies of data mining via domain driven data mining (DDDM). The presented paper tries to answer the question: "what can domain driven data mining do for real-life business applications?" Moreover the work attempts to provide information and abilities to fill the existing gap between academic researches and real-world business problems. Thomas Piton et al, paper [2] described that the trading activities of materials retail was concerned with an extremely competitive market. However, business people are not well informed about how to proceed and what to do during marketing activities. Data mining methods could be interesting to generate substantial profits for decision makers and to optimize the choice of different marketing activities. In the paper, they proposed an actionable knowledge discovery methodology, for one-to-one marketing, which allows to contact the right customer through the right communication channel. They presented a domain-driven view of knowledge discovery satisfying real business needs to improve the efficiency and outcome of several promotional marketing campaigns.

Palshikar et al, paper [3], Support analytics (i.e., statistical analysis, modeling and mining of customer/operations support tickets data) was important in service industries. In the paper, they adopted a domain-driven data mining approach to support analytics with a focus on IT infrastructure Support (ITIS) services. The proposed methodology can identify specific business questions and hence reduced an new algorithms for answering them. The questions are: (1) How to reduce the overall workload? (2) How to improve efforts spent in ticket processing? (3) How to improve compliance to service level agreements? We propose novel formalizations of these notions and propose rigorous statistics-based algorithms for these questions. The approach was domain-driven in the sense that the results produced are directly usable by and easy to understand for end-users having no expertise in data-mining, do not require any experimentation and often discover novel and non-obvious answers. All this helps in better acceptance among end-users and more active use of the results produced. The algorithms have been implemented and have produced satisfactory results on more than 25 real-life ITIS datasets, one of which they use for illustration.

Chengqi Zhang et al, paper [4], extant data mining were based on data-driven methodologies. The domain-driven data mining consists of a DDID-PD framework that considers key components such as constraint-based context, integrating domain knowledge, human-machine cooperation, in-depth mining, actionability enhancement, and iterative refinement process. They also illustrate some examples in mining actionable correlations in Australian Stock Exchange, which show that domain-driven data mining has potential to improve further the actionability of patterns for practical use by industry and business.Longbing Cao, paper [5], Traditional data mining research mainly focus]es on developing, demonstrating, and pushing the use of specific algorithms and models. The process of data mining stops at pattern identification. Consequently, a widely seen fact was that 1) many algorithms have been designed of which very few are repeatable and executable in the real world, 2) often many patterns are mined but a major proportion of them are either commonsense or of no particular interest to business, and 3) end users generally cannot easily understand and take them over for business use. In summary, they see that the findings are not actionable, and lack soft power in solving real-world complex problems.

To the end, domain-driven data mining (D3M) has been proposed to tackle the above issues, and promote the paradigm shift from "data-centered knowledge discovery" to "domain-driven, actionable knowledge delivery." In D3M, ubiquitous intelligence was incorporated into the mining process and models, and a corresponding problem-solving system was formed as the space for knowledge discovery and delivery. Based on the related work, the paper presents an overview of driving forces, theoretical frameworks, architectures, techniques, case studies, and open issues of D3M. We understand D3M discloses many critical issues with no thorough and mature solutions available for now, which indicates the challenges and prospects for the new topic.

In recent years, researchers with strong industrial engagement have realized the need to shift from "data mining" to "knowledge discovery" [6], [7], [8]. Targeting real-world problem solving, knowledge discovery was further expected to migrate into Actionable Knowledge Discovery and delivery (AKD). AKD aims to deliver knowledge that was business friendly, and which can be taken over by business people for seamless decision making. As a direct application of a recent research carried out by Atish et al. [9] established that there was interaction between the classification method of data mining and domain knowledge. They concluded that the incorporation of domain knowledge has a higher influence on performance for some data mining methods than for others. Chien et al. [10] collaborated with domain experts to develop specific recruitment and human resource Management strategies using data mining techniques. Their results were successfully applied in a real-world business.

Zhao et al. examined the effects of feature construction [11] guided by domain knowledge, on classification performance. The results of their study showed that feature construction, guided by domain knowledge, significantly improves classifier performance. An imbalance exists between the number of data mining algorithms published and the very few that are actually useful in a business setting. Hence conventional data mining has failed to deliver adequate results in decision making for real life business. A need therefore arises for a better framework within which better results can be obtained from existing data mining methodologies, techniques, tools and applications [12].

III. PROPOSED METHOD

The aim of the paper is to propose a methodology to fix the issues raised in the ticket submitted by the user in order to process the request, and to improve the customer satisfaction.The summary of the proposed methodology is as follows: The IT Organization comprises of several levels of industrial patterns, to manage and maintain the infrastructure. Each level performs its own functions depending upon the organizational structure. Domain-Driven Data Mining extends organizational toolbox and borrows from well-known industry patterns. Organizational patterns that the domain-driven data mining lays out are that there are solutions for every level of detail in the system. In this paper, the IT Infrastructure management can be carried out in Domain-Driven Data Mining in order to provide a generalized solution in any kinds of domain, that we can be implemented. The initial step is to receive the tickets from the user to process. Upon receiving the tickets from the user, the tickets can be classified into categories based on the concern. Since the tickets has been processed based on these categories. Upon classifying the tickets into categories, the next step is to check for any issues or errors arised in the submitted tickets. If so, then the issues are analyzed in order to verify whether the occurred issues are relevant to each other. After analyzing the issues, the next process is to find the ticket with high issue rate. The found ticket is then undergoes for the process. Then **RCA** is applied on the ticket.

RCA (Root Cause Analysis) is a method of problem solving that tries to identify the root causes of faults or problems that cause operating events. The RCA is applied on the tickets with issues. The result is then obtained and then analysis the result to get the ticket with high issue rate. The ticket with high issue rate is identified and then analyzed the cause for the issue. Upon analyzing the cause, the next step is to verify whether there is any option to fix the issue. If so, the next step is to apply CI on that issue.

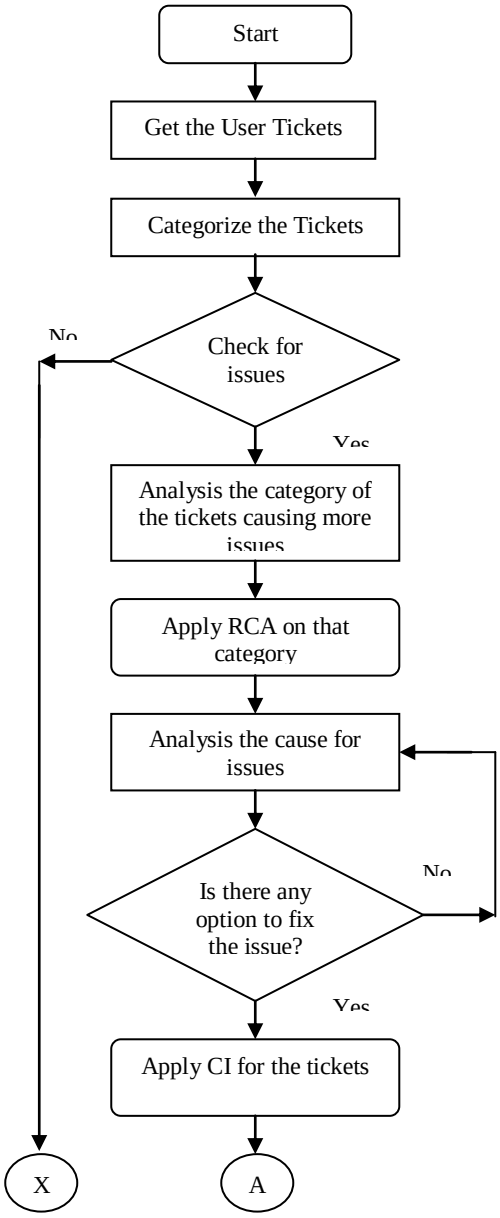
CI (Continuous Improvement) is a method to improve the status of the tickets with issues through continuous periodic improvement to overcome the issues. The CI can be applied on the ticket in the category, to find the solution. The identified solution can be applied on every ticket in the category and analyze whether the solution reduces the number of tickets causing the issue. If so, we can fix the solution to improve the customer satisfaction by reducing the number of tickets.Thus, with the help of RCA, we can analysis the cause for the issue and through CI, we can fix the issue and to reduce the number of tickets causing the issue. Through our proposed methodology, we can gain more advantages which are as discussed below:

- Reduce the number of issues.
- Increase the customer satisfaction
- Increase the number of customer requirements
- No need to wait for SLA
- Efficient way to fix the issue.

Thus our proposed methodology provides a better solution to manage the issues arised in the IT field.

Diagrammatic Representation

The diagrammatic representation of the proposed methodology is given in figure 1.



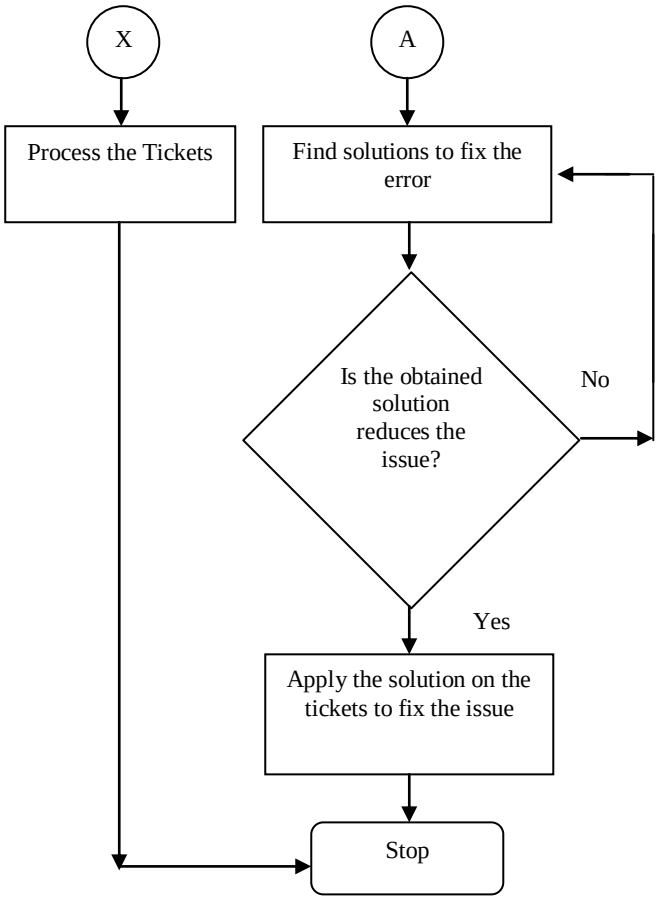


Fig.1 Representation of Proposed Method

Implementation Algorithm

Begin
Get the tickets from the user
Categorize the tickets based on the concern
For i in 1 to n categories
If issues on tickets = true then
ICat = category(i)
End if
Next
Apply RCA on ICat
Cause = Identify the root cause for the issue using RCA
If Cause possible to solve then
Apply CI on the tickets
Solution = Identify the solution using CI
End if
If Solution minimize the issue then
Apply Solution to fix the issue
End if
End

VI. EXPERIMENTAL RESULTS

The experiment is taken out in banking sector in order to verify the efficiency of our proposed method. In that banking sector, we undergo an experiment with two sections. First, we test the result of processing the tickets without implementing this proposed methodology. Also, each ticket is processed independently and so the time consumption to process the ticket becomes more. Secondly, we implement proposed methodology to verify the result. these tickets have been categorized and then it undergoes for processing. using proposed

methodology So the time consumption becomes less. Also the issues arised in the tickets has been processed efficiently in our proposed method than the existing method. The comparison has to be made between these two sectors and the resultant shows that the proposed method provides better solution in solving the tickets with issues in a much better way with the help of RCA and CI methods. The comparison result is shown below:

Table.1 Comparison Data

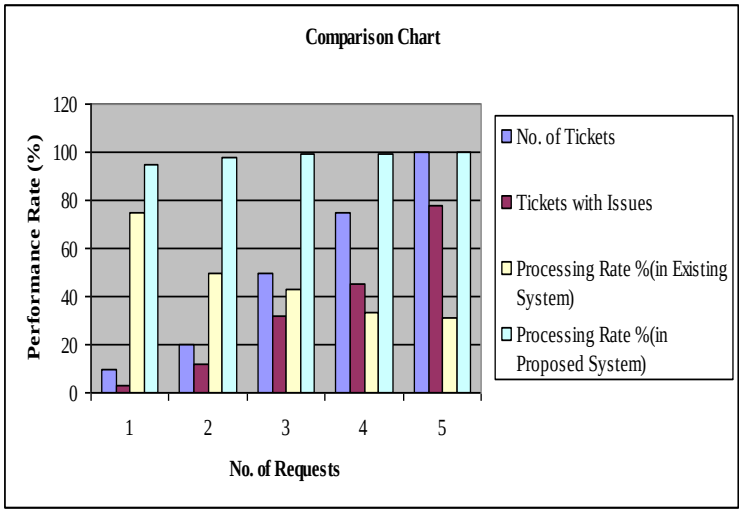


Fig.2 Comparison Chart

No. of Tickets	Tickets with Issues	Processing Rate %(in Existing System)	Processing Rate %(in Proposed System)
10	3	75	95
20	12	50	98
50	32	43	99
75	45	33	99
100	78	31	99.9

From the comparison chart, it is clear that when the number of tickets and the issues increases, the performance of the existing system becomes low compared to the proposed methodology. Thus, our proposed system performs well in solving and processing the tickets.

VII. CONCLUSION

Thus, the proposed methodology provides an efficient solution to fix the issues raised in the tickets through the methods RCA and CI. With the help of the proposed methodology, IT organization can process the tickets in a much more efficient way than before. Since, we can provide the strategy to reduce the number of tickets causing the issues, the number of customer requests has been increased. Also, there is no need to wait for SLA to process the tickets; the customer satisfaction also gets increased. Thus, our proposed methodology gives a better solution to manage the ticket processing in an IT organization and also to fix the issues raised in ticket processing.

REFERENCES

[1] Adeyemi Adejuwon and Amir Mosavi, "Domain Driven Data Mining – Application to Business", International Journal of Computer Science Issues (IJCSI), Vol. 7, Issue 4, No 2, July 2010.

[2] Thomas Piton, Julien Blanchard, Henri Briand and Fabrice Guillet, "Domain Driven Data Mining to Improve Promotional Campaign ROI and Select Marketing Channels", Knowledge and Decision Team.

[3] Palshikar, G.K., "Domain-Driven Data Mining for IT Infrastructure Support", IEEE International Conference on Data Mining workshops, 2010.

[4] Longbing Cao, Chengqi Zhang, "Domain-Driven Data Mining: A Practical Methodology", International Journal of Data Warehousing & Mining, 2(4), October-December 2006.

[5] Longbing Cao, "Domain-Driven Data Mining: Challenges and Prospects", IEEE Transactions on Knowledge and Data Engineering, Vol. 22, No. 6, June 2010.
[6] U. Fayyad and P. Smyth, "From Data Mining to Knowledge Discovery: An Overview," Advances in Knowledge Discovery and Data Mining, U. Fayyad and P. Smyth, eds., pp. 1-34, 1996.
[7] M. Ankerst, "Report on the SIGKDD-2002 Panel the Perfect Data Mining Tool: Interactive or Automated?" ACM SIGKDD Explorations Newsletter, vol. 4, no. 2, pp. 110-111, 2002.
[8] U. Fayyad, G. Shapiro, and R. Uthurusamy, "Summary from the KDD-03 Panel—Data Mining: The Next 10 Years," ACM SIGKDD Explorations Newsletter, vol. 5, no. 2, pp. 191-196, 2003.
[9] A. P. Sinha and H. Zhao, Incorporating domain knowledge into data mining classifiers: An application in indirect lending, Decision Support Systems vol.46, 2008, pp.287–299.
[10] C. Chien and L. Chen, Data mining to improve personnel selection and enhance human capital: A case study in hightechnology industry, Expert Systems with Applications, Vol. 34, 2008, pp. 280–290.
[11] H. Zhao, A. P. Sinha and W. Ge, Effects of feature construction on classification performance: An empirical study in bank failure prediction. Expert Systems with Applications Vol. 36, 2009, pp. 2633–2644
[12] Ankerst M. Report on the SIGKDD-2002 Panel the Perfect Pata Mining Tool: Interactive or Automated? ACM SIGKDD Explorations Newsletter, 4(2):110- 111, 2002.

The Rhythm of Omission of Articles and Verbs by Bengali EFL Students

Madhumita

ABSTRACT

English language plays an important role as an effective communication medium. It is used in schools ,colleges and universities. The aim of this study is to explore writing difficulties in the English language faced by second language learners particularly by Bengalis. A survey was conducted for this purpose. Majority of students with rural and urban backgrounds cannot communicate properly in English and perceive it as a very difficult subject. This paper reports on a small scale study which examined ten Bengali learners with a vernacular background. Data was collected from them in the form of essay writing. The main focus of the study has been on usage of articles and verbs in the written form. Seven of the students essays were studied in details. Results of the study indicated that students were facing a lot of difficulties in writing English language due to lack of vocabulary, poor spelling, L1 interference and a poor understanding of grammatical structure. Primary data was collected from the students of Shantiniketan and the secondary data was collected from other websites.

KEYWORD*: English language, writing difficulties, vernacular background, communication, Bengalis, medium, interference*

I. INTRODUCTION

Background-Bangla or Bengali is an Indo-Aryan language of the eastern Indian subcontinent, evolved from the Magadhi Prakrit, Pāli and Sanskrit languages.Bangla is native to the people residing in eastern South Asia known as Bengal, that is broadly occupied by Bangladesh and the Indian state of West Bengal. With nearly 250 million total speakers, Bangla is one of the most spoken languages in the world. The Bengali alphabet is derived from the Brahmi alphabet. It is also closely related to the Devanagari alphabet, from which it started to diverge in the 11th Century AD. The current printed form of Bengali alphabet first appeared in 1778 when Charles Wilkins developed printing in Bengali. A few archaic letters were modernised during the 19th century. Bengali has two literary styles: one is called *Sadhubhasa* (elegant language) and the other *Chaltibhasa* (current language). The former is the traditional literary style based on Middle Bengali of the sixteenth century, while the later is a 20th century creation and is based on the speech of educated people in Calcutta. The differences between the two styles are not huge and involve mainly forms of pronouns and verb conjugations. Some people prefer to call this alphabet the Eastern Nagari script or Eastern Neo-Brahmic script Notable features-The Bengali alphabet is a syllabic alphabet in which consonants all have an inherent vowel which has two different pronunciations, the choice of which is not always easy to determine and which is sometimes not pronounced at all. Vowels can be written as independent letters, or by using a variety of diacritical marks which are written above, below, before or after the consonant they belong to. When consonants occur together in clusters, special conjunct letters are used. The letters for the consonants other than the final one in the group are reduced. The inherent vowel only applies to the final consonant. Origin of the English language dates back from 1757 to 1947 in India.

By modern standards, British rule in India lasted a long time: nearly 200 years. Prior to English colonisation, India was a fragmented nation and was essentially multilingual, with 15 major languages and approximately 720 dialects. English language had served as a common ground for Indians and had granted separate cultural and ethnic groups to come nearer to each other. Although it was primarily the educated Indians from the fortunate caste who verbalised and mouthed in English, these were in fact the most influential people in terms of acting as `facilitators` for nationalistic ideas to be propagated throughout the populace. The spread of English language as the most redefining expression of the mass natives, was a key guiding factor and impetus to have had exercised a tremendous British influence on contemporary Indian literature, both in regional as well as in English.

What counts as Standard English will depend on both the locality and the particular varieties that Standard English is being contrasted with. A form that is considered standard in one region may be nonstandard in another, and a form that is standard by contrast with one variety (for example the language of inner-city African Americans) may be considered nonstandard by contrast with the usage of middle-class professionals. No matter how it is interpreted, however, Standard English in this sense shouldn't be regarded as being necessarily correct or unexceptionable, since it will include many kinds of language that could be faulted on various grounds, like the language of corporate memos and television advertisements or the conversations of middle-class high-school students. Thus while the term can serve a useful descriptive purpose providing the context makes its meaning clear, it shouldn't be construed as conferring any absolute positive evaluation. (*The American Heritage Dictionary of the English Language*, fourth edition, 2000).

"What *Is* 'Standard English'?" *RELC Journal*, Singapore, 1981)Written English and Spoken English- There are many grammar books, dictionaries and guides to English usage which describe and give advice on the standard English that appears in writing. . . . These books are widely used for guidance on what constitutes standard English. However, there is often also a tendency to apply these judgments, which are about written English, to spoken English. But the norms of spoken and written language are not the same; people don't talk like books even in the most formal of situations or contexts. If you can't refer to a written norm to describe spoken language, then, as we have seen, you base your judgments on the speech of the "best people," the "educated" or higher social classes. But basing your judgments on the usage of the educated is not without its difficulties. Speakers, even educated ones, use a variety of different forms. . . . (Linda Thomas, Ishtla Singh, Jean Stilwell Peccei, and Jason Jones, *Language, Society and Power: An Introduction*, Routledge, 2004). *Standard British English* is sometimes used as a synonym for Received Pronunciation (RP).Fossilization, in linguistics and second language acquisition (SLA), refers to the often-observed loss of progress in the acquisition of a second language (L2), following a period where learning occurred, despite regular exposure to and interaction with the L2 and regardless of any learner motivation to continue.

The number of second language learners who are considered to develop native like fluency in an L2 is generally assumed to be small. At some point in the learner's path of development, no further learning appears possible, with their performance apparently impervious to both further exposure to the L2 and explicit correction of errors. Because the L2 now appears 'set in stone', the term *fossilization* was used to describe this point. There is no particular level that can be identified at which learners appear to fossilize, though it is more often observed in intermediate proficiency levels and above. Whether fossilization is inevitable, very likely or avoidable has long been discussed in SLA. While some scholars have argued that native like fluency in an L2 is not possible beyond a certain age (the *critical period hypothesis*), others argue that fossilization is a result of a learning environment that is far from ideal, or a mind that has reached subconscious conclusions that are difficult to unlearn, meaning that a native like level of *ultimate attainment* is possible in the right conditions. The estimated proportion of learners able to master an L2 in such a way as to be indistinguishable from a native speaker appears to have increased over the years. Second language acquisition (SLA) refers to both the process and study of developing the ability to use a language other than the native tongue. Research focuses on the extent to which people coming to a second or subsequent language (L2, L3 and so on) develop competence in the language like that of a native speaker, and how similar the acquisition process is to first language acquisition. Where differences are identified, researchers seek to explain what is responsible - for example, whether there is a biologically-based 'critical period' that prevents acquisition after a certain age, or what social or psychological factors, such as exposure to written language, may account for non-native like attainment. Though the study of SLA is often viewed as part of applied linguistics, it is typically concerned with the language system and learning processes themselves, whereas applied linguistics may focus more on the experiences of the learner, particularly in the classroom. Additionally, SLA has mostly examined *naturalistic* acquisition, where learners acquire a language with little formal training or teaching.

The acquisition and use of a second language is essential to the everyday lives of people around the world. The trend for acquisition of second language affects the careers and life styles of people (Cook, 2001). English enjoys a status of second language in India as it is used extensively for many purposes in society. For acquiring and using any language effectively and efficiently, it is essential to master four basic skills, namely listening, speaking, reading and writing. Writing is not a natural activity, so explicit instructions are required for learning this skill (Aronoff & Rees- Miller, 2007) L1 interference has important implications in the learning of written expression. L1 learning is different from L2 learning, as the person already knows about meaning and use of one language. First language helps learners when it has elements in common with L2, but hinders the learning process when both language systems differ (Cook, 2001).

A person who speaks two languages has gone through the acquisition process twice, but second language learning takes many forms and occurs in many situations other than natural circumstances which cause problems (Cook, 1993). Grammar is the most difficult area for L2 writers. Students face difficulties in the use of correct sentence structure and paragraph development, and in creating a coherent form. Grammar skills include run-on sentences, fragments and verbiage, inclusion of necessary information, use of different type of sentences, subject-verb agreement, and placement of modifiers, tense agreement and parallel construction (Leisak, 1989). Grammar is more than just a set of rules; it is an ever evolving structure of a language (Kleisar, 2005). On the other hand, learning grammar can be pretty dull, as no one likes rules; and the memorization of rules is worse than applying them. Students usually know how to build tenses, but when they use them in written expression they are confused.

The effect of literacy on language acquisition has become a focal point of research, particularly since the 1990s. Literacy usually helps learning, such as by providing greater access to new vocabulary through written information,[1] and learners who read a lot do better on judging the grammaticality of sentences.[2] Literacy is gradually being identified as a key factor in language processing skills, i.e. literacy positively and negatively affects how well people interpret grammatical patterns, acquire the accent of another language, or perform in tasks involving the manipulation of linguistic utterances. This may account for some of the effects of the critical period hypothesis, for example. Modern research on L2 acquisition is rooted in *contrastive analysis*, a viewpoint popular in the 1950s and which sought to explain and predict errors in language learning based on a comparison of the grammar and phonology of the learner's L1 versus the 'target' L2. Though contrastive analysis mostly gave way to theories of L2 acquisition that better-reflected new insights from modern linguistics, psychology and education, it continues to be a tool for spotting potential problems for teaching in the classroom, and as a potential explanation for errors in naturalistic performance - i.e. the understanding and production of spontaneous language by English language learning in Japan

English is a compulsory subject in Japanese schools from the age of 11; students who enter university are also obliged to take an English course in their first year, assessed through the TOEIC exam.[3] However, although the Japanese government has issued guidelines requiring a focus on real-life communication skills,[4] most teaching is still very 'traditional': a focus on learning grammar rules and on reading the language, with Japanese as the medium of instruction used by almost exclusively Japanese native-speaking teachers. This means that exposure to native English can be limited for many learners, who may have few opportunities to practice listening and speaking learners.

II. RESEARCH METHODOLOGY

A sample survey was conducted using quantitative method from a size of seven respondents from Shantiniketan,Birbhum,West Bengal, India.An investigative approach was observed for an in-depth study of the written essays of seven respondents. All the seven respondents have a vernacular background and are 12th standard students. Primary data was collected from them in the form of written essays.

2.1. Method of Analysis

All the respondents were asked to write three essays of 100 words each in present tense, future tense and past tense. The topic given to them-

Past tense - My favorite teacher in primary.
Present tense- Why am I studying Arts /commerce /science? or One day in my life.
Future tense- What do you want to become…?

Error analysis

The purpose of the exercise was to observe the frequency with which errors relating to the following were being made by the respondents.

[1] Checking error for Articles and Verbs
[2] Rhythm of omission
[3] Recurring mistakes

2.2. Problems

Factors taken into consideration-As far as possible care was taken to take the sample group having similar features.

All of them are from Rural background and have vernacular background

[1] Economic factors- Lower middle class
[2] Age factor-Between 16-18 yrs of age
[3] All respondents studying in the 12th standard

2.3 Data analysis

I. Checking error for Articles and Verbs

Errors in usage of Articles

Given below is the table which shows the errors made by the respondents in use of Articles.

S. No	Name	Error of Article	Recurring Mistake	Missing Article	Not Required Article	Total Errors
1	Paripurna Bose	2	0	0	1	3
2	Rik Majumdar	1	2	0	1	4
3	Sudipta Pal	0	0	0	0	0
4	Deepanjan Mitra	0	4	0	0	4
5	Suchetna Chakravarty	0	0	2	0	2
6	Paramita Ghosh	0	0	0	0	0
7	Camellia Mandal	3	0	0	1	4
	Total	5	6	2	3	

Table No: 1

2.4. Observations:

- The scores indicate that 5 respondents out of 7 have made errors in usage of Articles.
- Maximum errors were observed two areas: Error of Articles and Recurring mistakes.
- Least mistakes were made in 'Missing Article' that too by only one respondent.
- Three of seven respondents have made a single error each in using 'Not required Article'
- Respondent numbers 3 and 6 have not made any mistakes in usage of Articles.

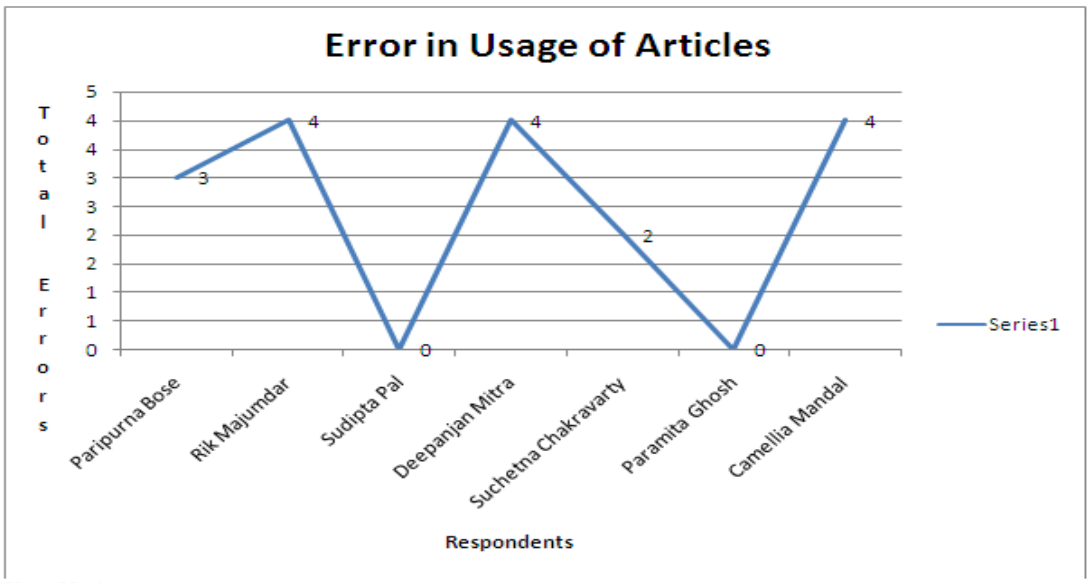
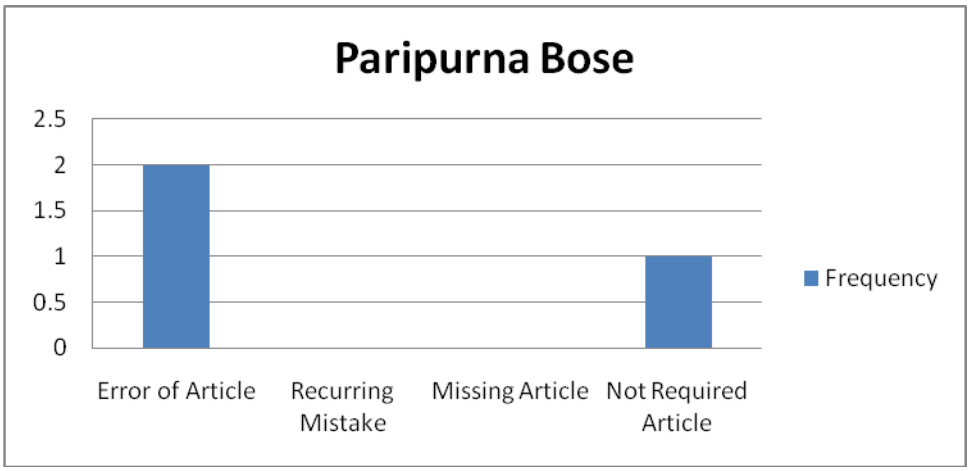


Chart No 1

Rhythm of omission in Articles

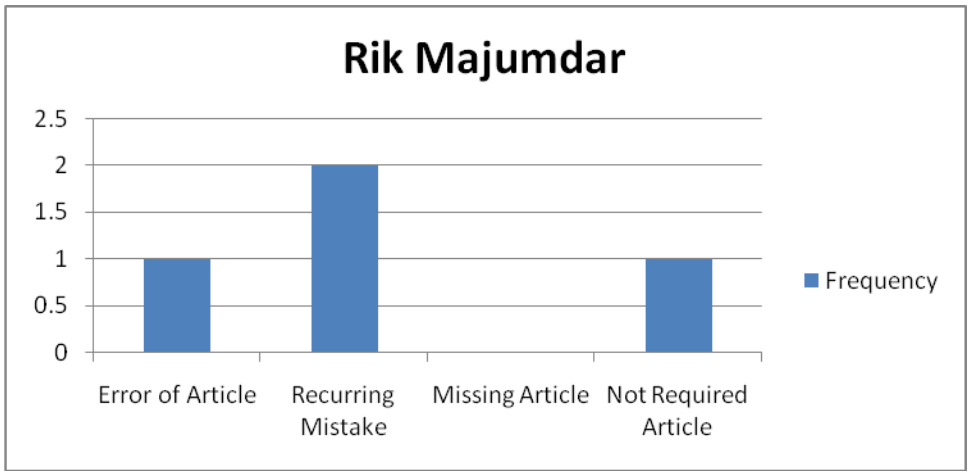
Given below is the graphical representation of each respondent in the frequency of errors of Articles:

1. Paripurna Bose:



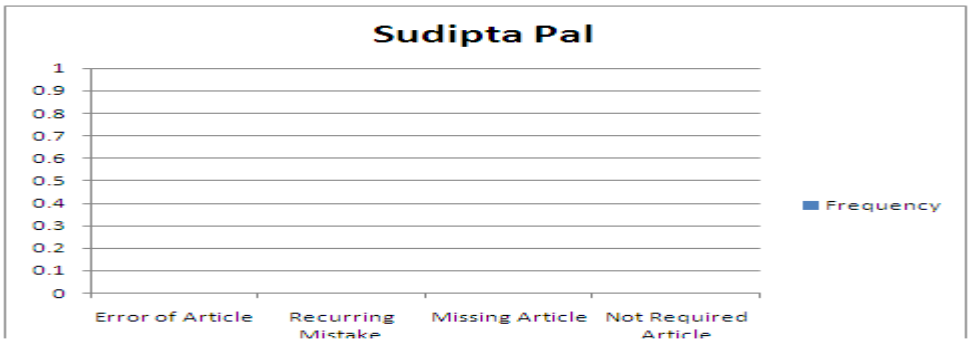
This Respondent has not made any mistakes in 'Recurring Mistakes' and 'Missing Articles'.

2. Rik Majumdar:



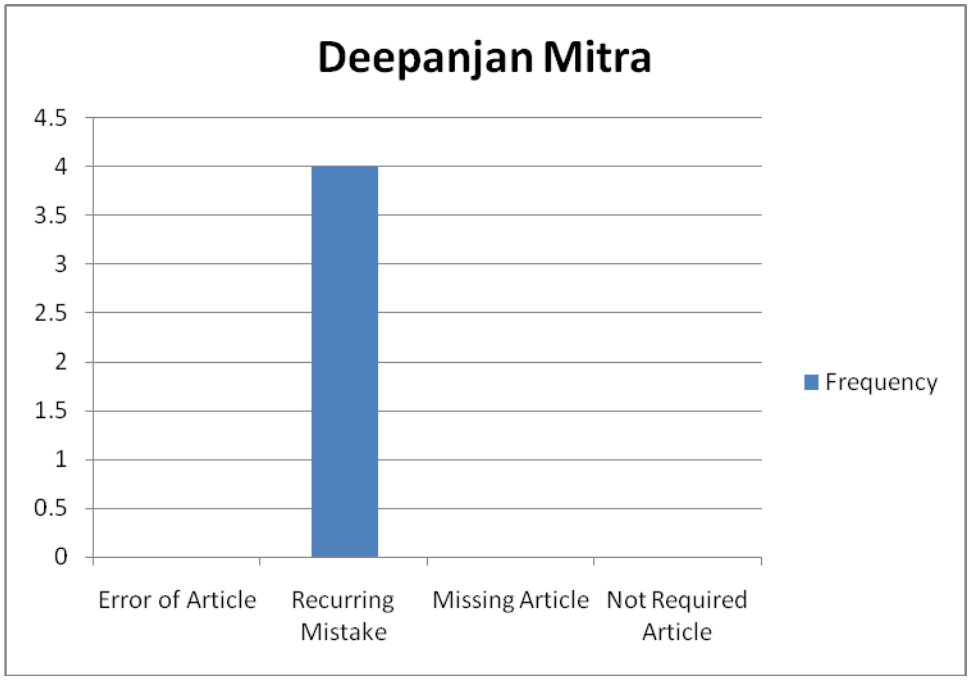
This respondent has not made any mistakes in 'Missing Articles'

3. Sudipta Pal



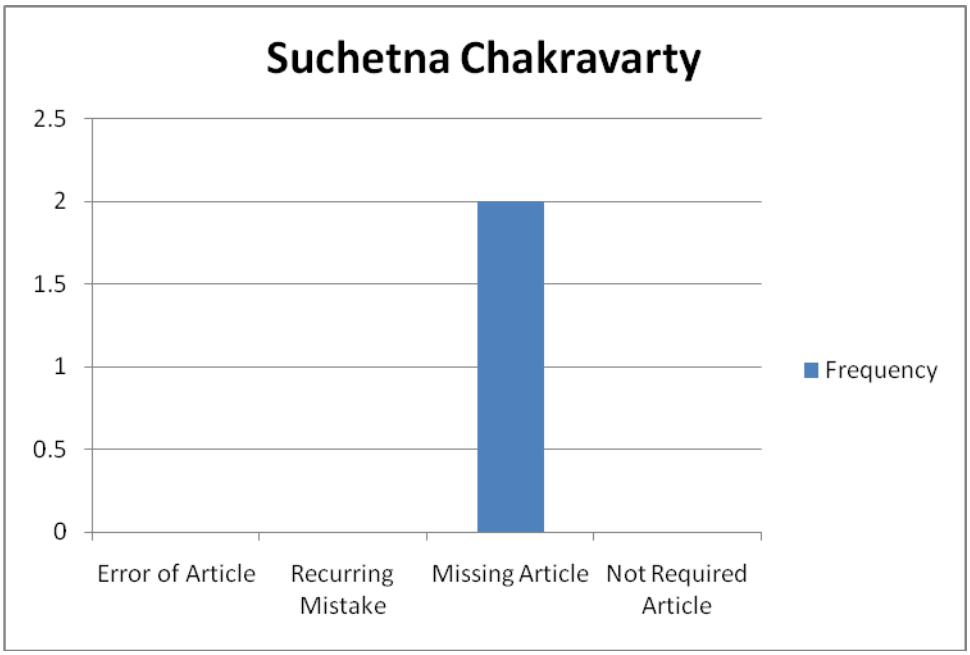
This respondent has performed well and has not made any error in Articles.

4. Deepanjan Mitra



This respondent has not made any mistakes in 'Error of Article', 'Missing Article', 'Not Required Article' but has made errors in 'Recurring Mistakes'.

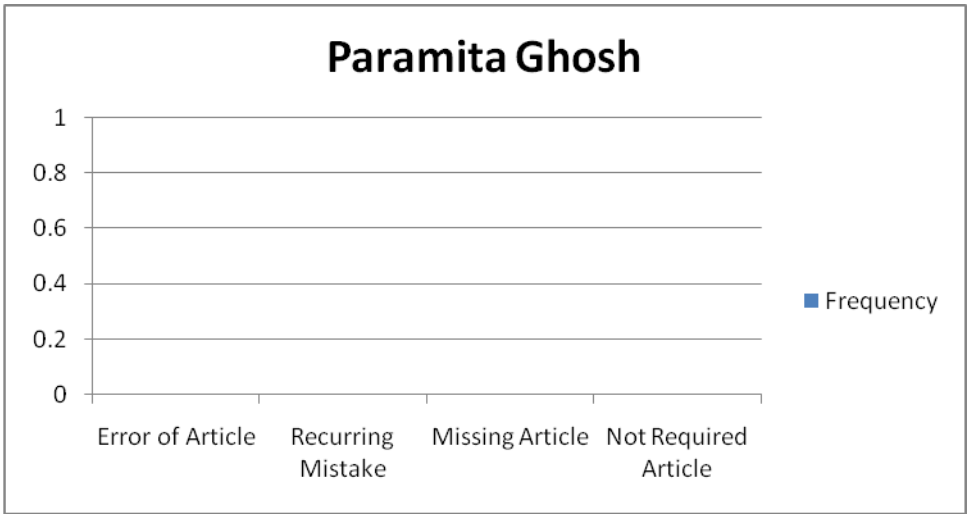
5. Suchetna Chakravarty



This respondent has not made any mistakes in 'Error of article',Recurring mistakes',and 'Not Required Article'.

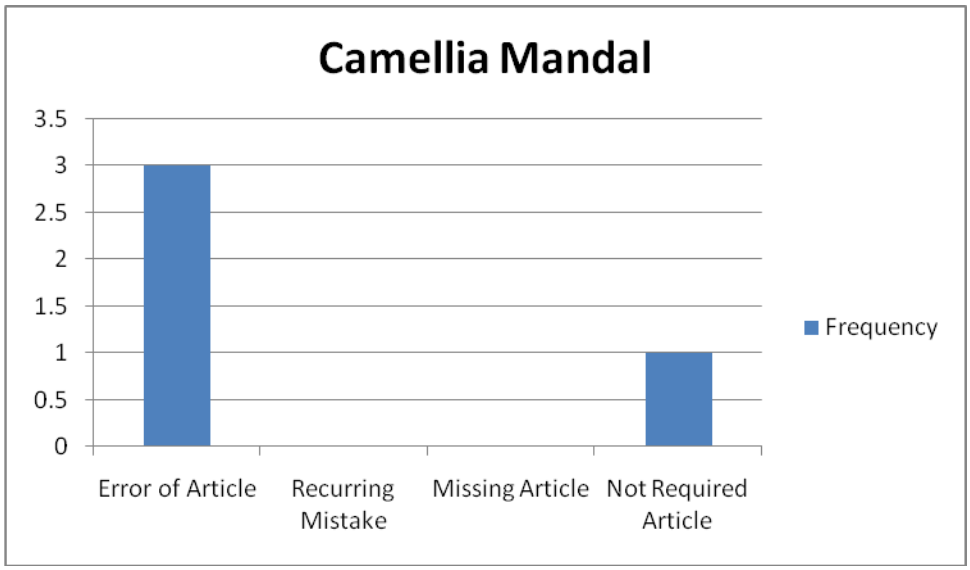
The respondent has made mistakes in 'Missing Articles'.

6. Paramita Ghosh



This respondent has made no mistakes

7 Camellia Mandal



The respondent has not made any mistakes in Recurring Mistake and Missing Article.
The respondent has made mistakes in Error of Article and Not Required Article.

a. Errors in usage of Verbs

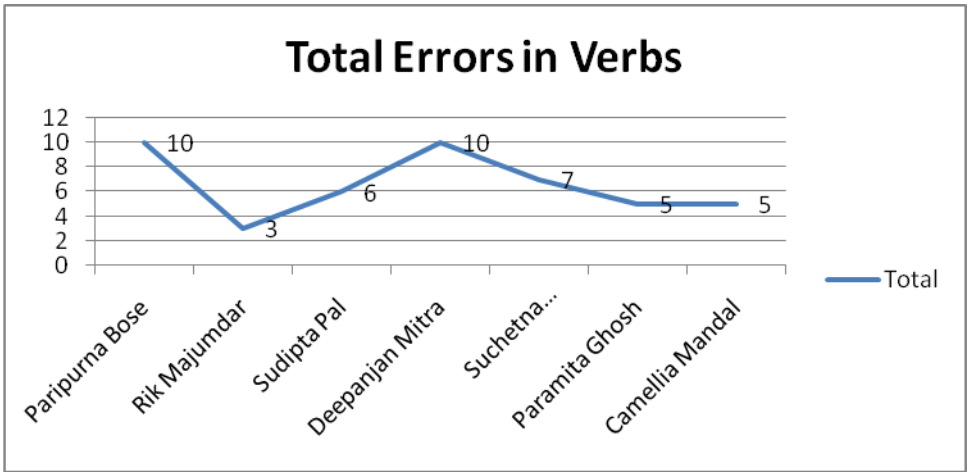
Given below is the table which shows the errors made by the Respondents in use of Verbs.

S. No	Name	mistake of verbs	recurring mistakes	missing verbs	not required verbs	Total
1	Paripurna Bose	7	1	2	0	10
2	Rik Majumdar	3	0	0	0	3
3	Sudipta Pal	6	0	0	0	6
4	Deepanjan Mitra	6	4	0	0	10
5	Suchetna Chakravarty	5	0	1	1	7
6	Paramita Ghosh	5	0	0	0	5
7	Camellia Mandal	4	0	0	1	5
	Total	36	5	3	2	

Table no.2

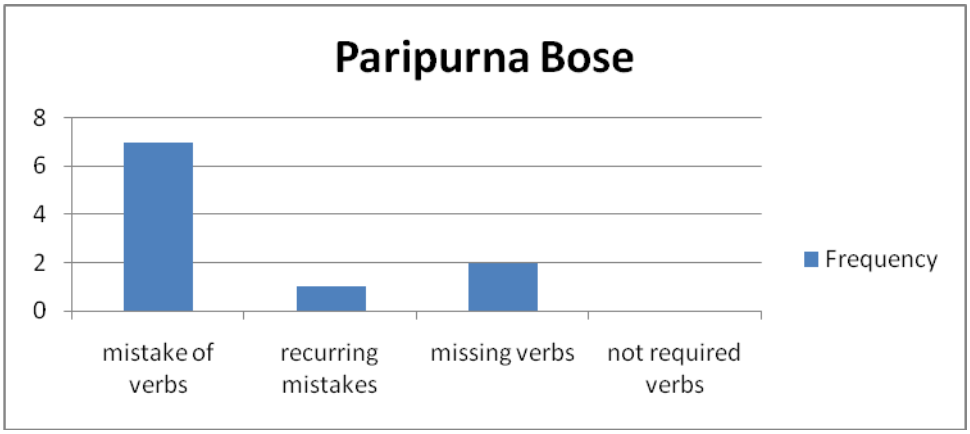
Observations:

- The scores indicate that all the 7 respondents have made errors in usage of verbs.
- Maximum error was observed in the area of: Mistakes of Verbs.
- Least mistakes were made in Not required verbs
- In Recurring mistakes respondent no 1.and respondent no.4 have made errors.
- In missing verbs respondent no 1.and respondent no.5 have made errors.
- In Not Required verbs respondent no 5.and respondent no.7 have made errors.



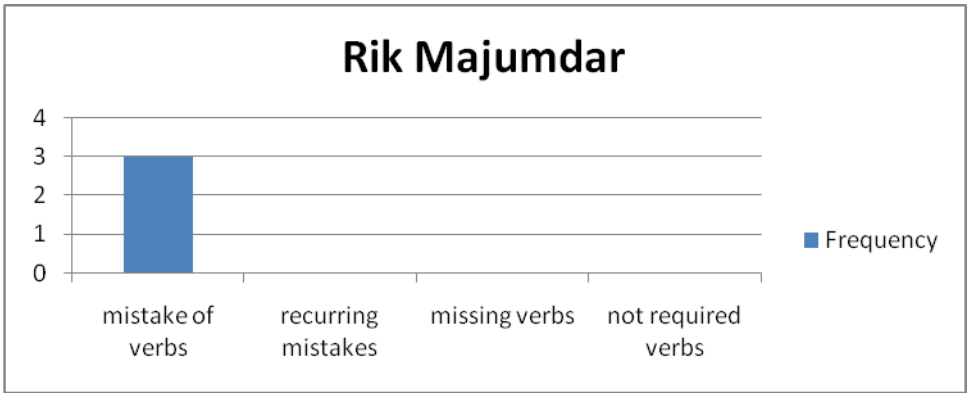
Rhythm of omission in Verbs

1.



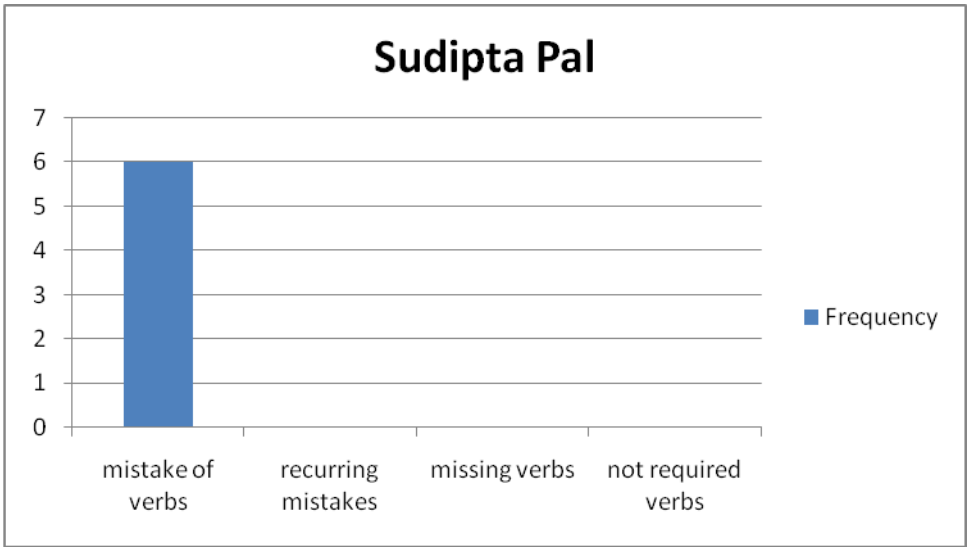
This respondent has not made any mistakes in Not Required verbs.
The respondent has made mistakes in Mistake of Verbs, Recurring verbs and Missing verbs.

2.

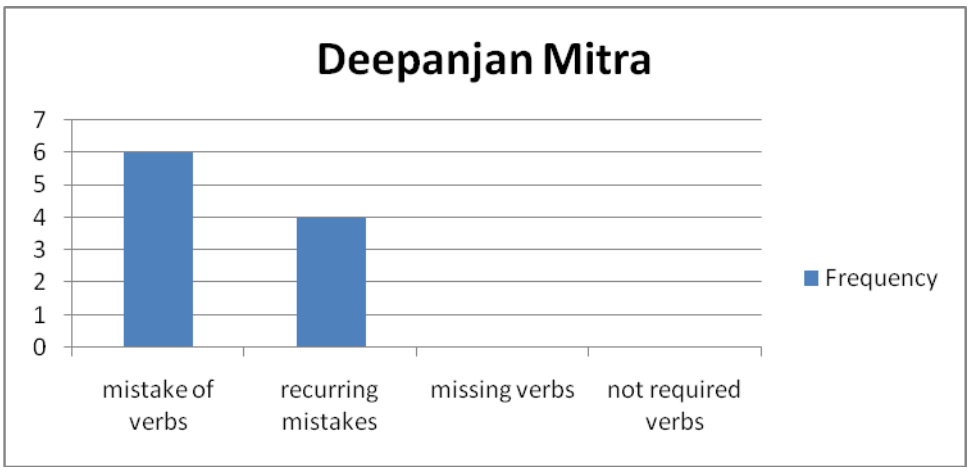


The respondent has made errors only in Mistakes of verbs.

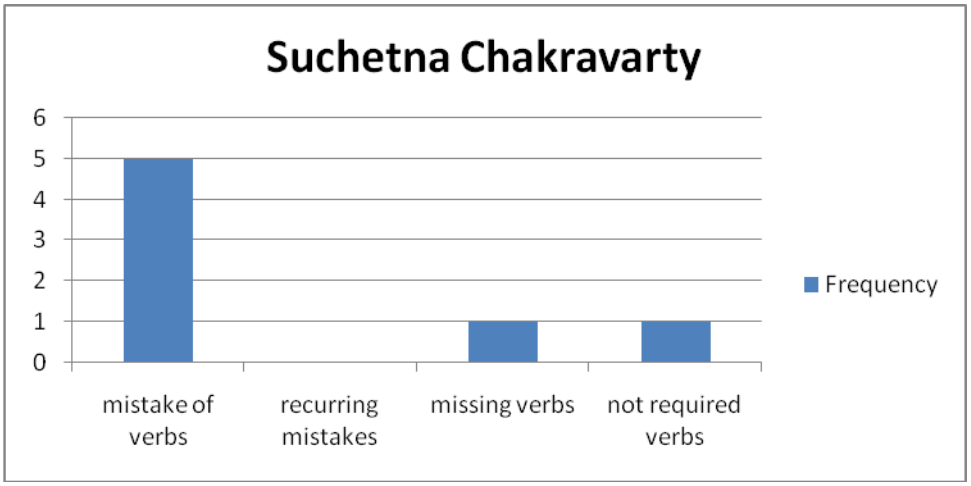
3.



The respondent has made error only in Mistake of verbs.

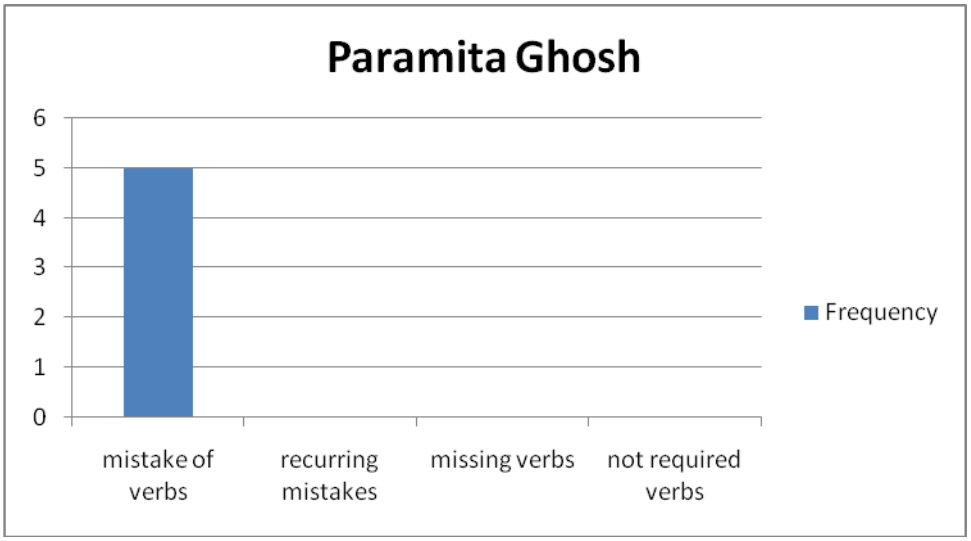


The respondent has made error in Mistake of verbs and Recurring Mistakes.

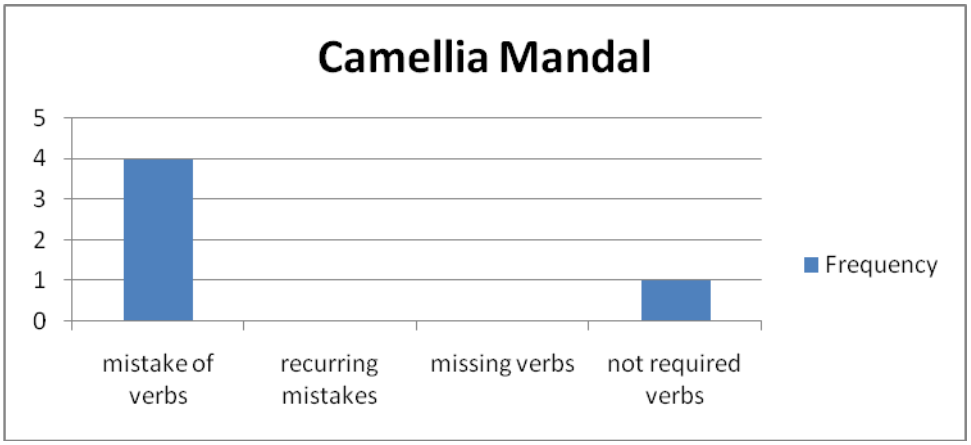


The respondent has made maximum errors in Mistake of verbs.
The respondent has not made any errors in Recurring mistakes.

The respondent has made equal number of errors in Missing verbs and Not required Verbs.



The respondent has not made any mistakes in Recurring Mistakes ,Missing verbs ,Not required verbs.
The respondent has made mistakes only in mistake of verbs.



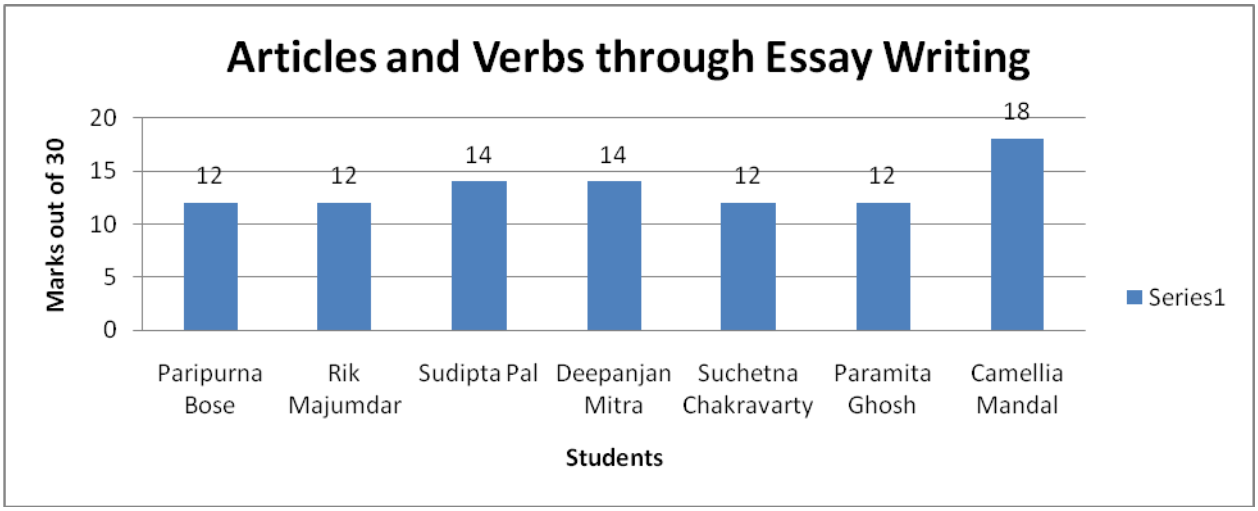
The respondent has not made any errors in recurring mistakes and Missing verbs.
The respondent has made maximum number of errors in Mistake of verbs and least in Not required verbs.

Results

Total Number of Errors:

Evaluation of use of Articles and Verbs through Essay Writing:

S. No	Name	Mark out of 30
1	Paripurna Bose	12
2	Rik Majumdar	12
3	Sudipta Pal	14
4	Deepanjan Mitra	14
5	Suchetna Chakravarty	12
6	Paramita Ghosh	12
7	Camellia Mandal	18



Rating scale

1-5	**Very poor**
6-10	**poor**
11-15	**average**
16-20	**good**
21-25	**Very good**
26-30	**excellent**

Six respondents have scored between 11-15 therefore their performance is average.
The last respondent has scored 18 out of 30 and his performance is good.

Findings

Articles -Five respondents made mistakes out of seven.
Verbs –All the seven respondents made mistakes in usage of verbs.
From the survey it became evident that a majority (71%) of the sample respondents are very weak in the use of articles and all the respondents are poor in the usage of verbs .
L1 influence can be seen.Six out of seven candidates made sentence construction mistakes and all the seven respondents made spelling mistakes.

REFERENCES

[1] http://www.historyhome.co.uk/c-eight/india/india.htm
[2] http://asianhistory.about.com/od/colonialisminasia/p/profbritraj.htm
[3] http://asian-efl-journal.com/register
[4] http://www.indianetzone.com/42/british_influence_on_contemporary_indian_literature_contemporary_indian_literature.htm
[5] http://grammar.about.com/od/rs/g/standbriteterm.htm
[6] http://grammar.about.com/od/grammarfaq/a/standardenglish.htm
[7] http://grammar.about.com/od/grammarfaq/a/standardenglish_2.htm
[8] http://grammar.about.com/od/grammarfaq/f/QAFamilySlang.htm
[9] http://grammar.about.com/od/il/g/linguisticvariationterm.htm
[10] http://grammar.about.com/od/e/g/Ethnic-Dialect.htm
[11] http://grammar.about.com/od/ab/g/aaveterm.htm
[12] http://in.ask.com/web?q=Interlanguage&o=3341&l=sem&qsrc=466
[13] http://www.usingenglish.com/forum/linguistics/23458-contrastive-linguistics.html
[14] http://en.citizendium.org/wiki/Fossilization_%28language_acquisition%29
[15] http://en.citizendium.org/wiki/Second_language_acquisition
[16] http://en.citizendium.org/wiki/Category:Linguistics_Content
[17] http://en.citizendium.org/wiki/Accelerated_early_childhood_education
[18] http://middlekingdomlife.com/guide/teaching-english-chinese-students.htm
[19] http://www.articlesbase.com/languages-articles/phonetic-and-phonological-problems-encountered-by-the-bengali-speaking-efl-learner-how-can-they-be-overcome-297445.html

[20] http://www.google.co.in/search?hl=en&newwindow=1&safe=off&biw=1366&bih=596&q=difficulties+faced+by+bengalis+when+speaking+in+english-Articles&oq=difficulties+faced+by+bengalis+when+speaking+in+english-Articles&gs

[21] http://books.google.co.in/books?

Image Segmentation Using RGB Decomposition and Modified Bacterial Foraging Optimization

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ABSTRACT:
This paper addresses the problem of segmenting the image into various color components by using combined approach of Modified Bacterial foraging optimization approach and RGB Decomposition. The original image is decomposed into separate planes of R G and B and then modified Bacterial Foraging algorithm is applied on three planes separately to calculate three different thresholds. Segmentation is performed on the basis of Thresholding. Since Image segmentation is the basic step in many image processing applications so faithful segmentation algorithm must be developed for successful implementation of the processing applications. Main aim of image segmentation is to extract the information which is of interest for a particular application. This methodology will be able to separate three different colors of original image. The accuracy of any algorithm varies with input image. This is an extensive research area as many applications depend upon results of the algorithm for image segmentation, but it is still difficult to assess whether one algorithm produces more accurate results than another for all type of images.

KEYWORDS: *Modified BFO, RGB planes, Segmentation, Thresholding*

I. INTRODUCTION

Image segmentation deals with dividing the image according to either similarity or dissimilarity. It is an important prospect in image analysis. Color is a perceptual phenomenon related to human response to different wavelengths in the visible electromagnetic spectrum [1].Color is the most prominent feature of any image. Extracting color information from any image has many applications related to computer vision algorithms. Color of an image can carry much more information than gray level [2].

In a broad sense the colored images segmentation are classified as follows:-

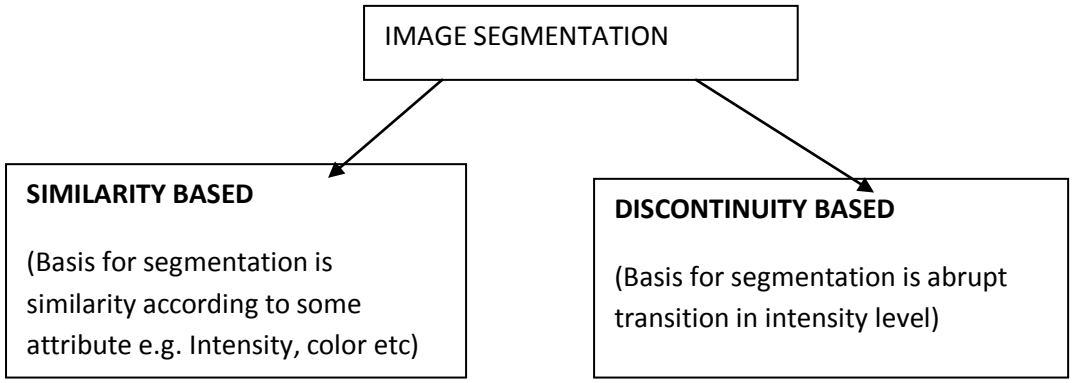


Figure 1:- Types of Image Segmentation

1.1 Similarity Based Segmentation Techniques:-

Similarity based segmentation techniques consists of Thresholding methods and region based methods. Thresholding methods convert grayscale image into binary image (Black and white) image by first choosing a

gray level in the original image and then turning every pixel black or white according to whether its gray value is greater or less than T.[3]

A pixel = White if gray value >T

= Black if gray value <T

Region based methods -The main principle behind region growing method is a collection of pixels with similar properties (color, intensity level etc.) to form a region. Region growing method partitions an image into regions that are similar according to given criteria, such as gray character, color character or texture character.

1.2 Discontinuity Based Segmentation Techniques Discontinuity based segmentation techniques consists of Edge detection, Line detection and Point detection methods. Edge is a boundary between two homogeneous regions. Edge detection refers to the process of identifying and locating sharp discontinuities in an image.

II. BACTERIA FORAGING OPTIMIZATION

This algorithm is one in class of nature inspired algorithm developed in order to solve number of optimization problems. It is a widely accepted algorithm for optimization based on social foraging behavior of E.coli bacteria. Bacteria move towards a particular direction in search of food based upon gradients of chemicals present in the environment. Foraging means locating, handling, and ingesting food [4].Bacterial foraging optimization algorithm (BFOA) has been widely accepted as a global optimization algorithm of current interest for distributed optimization and control The course(process) of natural selection tends to eradicate animals having poor foraging strategies and favor the propagation of genes of those animals that have flourishing foraging strategies, since they are more credible to enjoy reproductive success[5]. BFO is designed to tackle non gradient optimization problems and to handle complex and non differentiable objective functions. After many generations, weak foraging strategies are either eliminated or shaped into good ones. This stroke (action) of foraging led the researchers to use it as optimization process. The *Escherichia Coli or E. coli* bacteria that are present in our intestines also experience a foraging strategy. The control system of these bacteria that dictates how foraging should continue consists of four principal mechanisms, namely chemotaxis, swarming, reproduction, and elimination dispersal.BFO has been successfully applied on various applications like Option Model calibration [6], image processing [7], RFID Network scheduling [8] and many other applications.
The four basic steps in BFOA are explained below [9]

1.Chemotaxis:- In the original BFO, a unit walk of the bacteria with random direction represents a “tumble” and a unit walk with the same direction in the last step indicates a “run.” It can move in two different strategies. It can swim for a period of time in the same direction or it may tumble, and alternate between these two modes of operation for the entire lifetime.

2. Swarming: - A group of E.coli cells arrange themselves in a travelling ring by moving up the nutrient gradient when placed amidst a semisolid matrix with a single nutrient chemo-effecter. The cells when stimulated by a high level of succinate, release an attractant aspartate, which helps them to aggregate into groups and thus move as concentric patterns of swarms with high bacterial density.

3. Reproduction:- The least healthy bacteria eventually die while each of the healthier bacteria (those yielding lower value of the objective function) asexually split into two bacteria, which are then placed in the same location. This keeps the population of bacteria constant.

4. Elimination and Dispersal: - The chemotaxis provides a basis for searching the local best solution
And reproduction process speeds up the convergence which has been simulated by the classical BFO. The bacteria with the best positions are kept and the remaining bacteria population is killed. The bacteria with best positions are then moved to another position within the environment.

III. PROPOSED WORK

The proposed modified bacterial foraging algorithm is implemented on the input image in the following steps:
Step-1: The input image is first converted into its RGB image components. Therefore, we get three images in red, green and blue components.
Step-2: Maximum No. of Colors in any color component image = 256 (Black to Red, Black to Green nd Black to Blue)

Step-3: Initialize Threshold in each RGB component image as TR = 0, TG = 0 and TB = 0
Step-4: Take the red component image. Compute the size of the image into row x column giving rise to bacterial search area.
Step-5: Initialize the Nc and Ns steps at 1. Nc = 1 and Ns=1; Chemo tactic and swim length.
Step-6: Compute the health status of all image pixels by using the image histogram. The health status of ith color pixel Hi is given by:
Hi = Pi / (row x column), where Pi is the no. of pixels of ith color.
Step-7: Compute the Euclidean distance ED between the adjacent pixels as ED = F(r,c) – F(r,c+1)
Where F(r,c) and F(r,c+1) are the pixel color value of two adjacent pixels.
Step-8: If ED is less than some threshold ED, then replace the F(r,c) by F(r,c+1), thereby reducing the no. of colors in the entire image.
Step-9: Now compute the difference of health status of H(r,c) and H(r,c+1) pixel . If H(r,c) and H(r,c+1) are less than the threshold health status, then they are the unpopular colors and can be eliminated to produce a new color.
Step-10: Keep on adding the color value to TH, TG or TR as may be the case from step-4.
Step-11: Move the pixel pointer over the entire image.
Step-12: Repeat from step-4 to 11 for green and blue component images in the same manner and compute the TR, TG and TB.
Step-13: Compute the individual thresholds as given by:
TH = TH/Image Size, TG = TG/Image Size TB = TB/Image Size
Step-14: Compute the final threshold as given by: T = (TH + TG + TR)/3
Step-15: Apply the final threshold over the original image and compute the performance indices as standard deviation, entropy, PSNR and class variance.

IV PERFORMANCE INDICES

Following performance indices are evaluated for measuring performance of the proposed algorithm
PSNR: The peak-signal to noise ratio (PSNR) was used to evaluate the reconstructed image quality. The PSNR is defined as follows:

$$PSNR = 10\log_{10}\frac{255^2}{\frac{1}{N\times N}\sum_{i=0}^{N-1}\sum_{j=0}^{N-1}\left(f(i,j)-\hat{f}(i,j)\right)^2}dB,$$

where N × N is the size of the original image and f(i,j) and ˆf(i,j) are the gray-level pixel values of the original and reconstructed images, respectively.

Standard Deviation (SD): The standard variation of an image is given by:

$$\hat{\sigma}^2 = \frac{1}{n\times n}\sum_{j=1}^{n}\sum_{i=1}^{m}(x_{i,j}-\hat{\mu})^2,$$

This corresponds to the degree of deviation between the gray levels and its mean value, for the overall image.

Entropy E: The expression of the information entropy of an image is given by:

$$H = -\sum_{i=0}^{L-1} p_i \ln p_i,$$

Where L denotes the number of gray level, pi equals the ratio between the number of pixels whose gray value equals i (0 to L - 1) and the total pixel number contained in an image. The information entropy measures the richness of information in an image. If pi is the const for an arbitrary gray level, it can be proved that the entropy will reach its maximum. Below given figures shows the results of the segmentation obtained by Ostu algorithm and proposed algorithm. Fig. 1 is the original image, while fig. 2 and 3 shows the segmented image obtained after applying the Otsu and modified proposed algorithm.Class Variance: Class variance of the segmented image is computed by the following computation method:If the histogram is divided into two classes by the gray-level intensity t (threshold), then the probabilities of the respective classes can be expressed as:

$$p_1(t) = \sum_{i=0}^{t} p(i) \qquad p_2(t) = \sum_{i=t+1}^{N-1} p(i)$$

and

Also, the class means m1 and m2 are given by:

$$m_1(t) = \sum_{i=0}^{t} ip(i) / p_1(t)$$

$$m_2(t) = \sum_{i=t+1}^{N-1} ip(i) / p_2(t)$$

The two class variances are given by:

$$\sigma_1^2(t) = \sum_{i=0}^{t} (i - m_1)^2 \frac{p(i)}{p_1(t)}$$

$$\sigma_2^2(t) = \sum_{i=t+1}^{N-1} (i - m_2)^2 \frac{p(i)}{p_2(t)}$$

The total class variance (σ_T) is given by:

$$\sigma^2{}_T = \sigma_2{}^B + \sigma^2{}_W$$

Where $\sigma^2{}_B$ is the between class variance and $\sigma^2{}_W$ is the within class variance and given by following equations.

$$\sigma^2{}_W (t) = p_1(t)\, \sigma_1{}^2(t) + p_2(t)\, \sigma^2{}_2(t)$$

$$\sigma^2{}_B (t) = p_1(t).p_2(t)\, \{m1(t) - m2(t)\}^2$$

V RESULTS

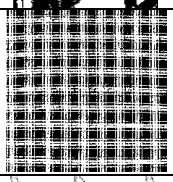
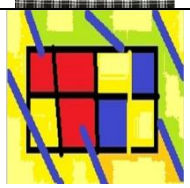
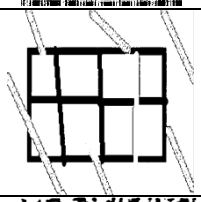
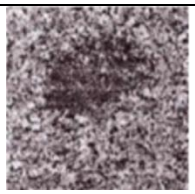
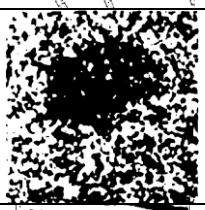
The proposed algorithm is implemented on different images using matlab code. Table 1 depicts the values of the performance indices for all the images. Threshold, Standard Deviation, Class Variance and Entropy is being calculated and shown. The performance indices calculated through the code proved the results are better than the previously suggested techniques.

Table 1

Images	Threshold	Standard Deviation	Class Variance	Entropy
Hunterman	0.3705	0.4821	0.0070	0.9601
Leena	0.4638	0.4342	0.0049	0.9134
BW Pattern	0.5956	0.4594	0.0098	0.8409
Colored Pattern	0.3184	0.3933	0.0401	0.7258
Dotted Pattern	0.6095	0.4373	0.0045	0.9522
Airplane	0.5683	0.4297	0.0034	0.8860

Table 2 shows the results of the matlab code for the above said images. Original as well as segmented images are being shown in the tabular form.

Table 2

Image Name	Original Image	Segmented Image with modified BFO
Hunterman		
Leena		
BW Pattern		
Colored Pattern		
Dotted Pattern		
Airplane		

V1 CONCLUSION

It has been observed from the results that the proposed algorithm offers a more resolved thresholding in comparison to any other thresholding method like Otsu or watershed. The image decomposition into its RGB components and computation of threshold in each component image using BFO algorithm prove to be a good tool in order to faithfully segment or threshold the image. The proposed algorithm finds some limitation at the end of time of computation. This is because the algorithm runs three times on the input image in R, G and B components. Further if the size of the image increases, the time may again increase. However, the speed of algorithm can be optimized when running the same on high performance machine. The final threshold value has been computed by taking the mean of the three components thresholds. Further work may be carried out in order to integrate the three thresholds to fine tune the application.

REFERENCES

[1] Rosenfeld and Kak, Digital Picture Processing. 2, Academic Press, New York, 1982

[2] H. D. Cheng, X. H. Jiang, Y. Sun, and J. L. Wang, "Color image segmentation: Advances and prospects," Pattern Recognition., Volume 34 Issue 12 December 2011 pp 2259-2281

[3] Alasdair Mc Andrew, An Introduction to Digital Image Processing with Matlab, Cengage learning

[4] S.Saadi, A.Kouzou, A.Guessoum, M.Bettayeb "Bacterial Foraging Algorithm for Neutron Radiography Image Quality Improvement"] 201O 7th International Multi-Conference on Systems, Signals and Devices

[5] K. M. Passino, "Biomimicry of bacterial foraging for distributed optimization and control," *IEEE Control Systems Magazine*, vol. 22, pp. 52–67, 2002.optimization and control," Control Systems Magazine, vol. 22, no. 3, pp. 52-67, Jun 2002.

[6] Kevin M Passino, "Biomimicry for optimisation,control,automation" Springer-Verlag London,UK 2005

[7] Bakwad KM, Pattnaik SS, Sohi BS, Devi S, Panigrahi BK, Sastri GSVR, "Bacterial Foraging Optimization Technique Cascaded with Adaptive Filter to Enhance Peak Signal to Noise Ratio from Single Image", IETE Journal of Research, Vol 55 (4), Jul-Aug 2009.

[8] Liu W, Chen H, Chen H, and Chen M, "RFID Network Scheduling Using an Adaptive Bacteria Foraging Algorithm", Journal of Computer Information Systems (JCIS), Vol. 7(4), 2011, pp. 1238-1245.

[9] Sambarta Dasgupta, Swagatam Das "Bacterial Foraging Optimization Algorithm: Theoretical Foundations, Analysis, and Applications" Studies in Computational intelligence volume 203,2009 pp23-55

Performance Comparison of Rayleigh and Rician Fading Channels In QAM Modulation Scheme Using Simulink Environment

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ABSTRACT:
Fading refers to the fluctuations in signal strength when received at the receiver and it is classified into two types as fast fading and slow fading. The multipath propagation of the transmitted signal, which causes fast fading, is because of the three propagation mechanisms described as reflection, diffraction and scattering. The multiple signal paths may sometimes add constructively or sometimes destructively at the receiver, causing a variation in the power level of the received signal. The received signal envelope of a fast-fading signal is said to follow a Rayleigh distribution if there is no line-of-sight between the transmitter and the receiver and a Ricean distribution if one such path is available. The Performance comparison of the Rayleigh and Rician Fading channels in Quadrature Amplitude Modulation using Simulink tool is dealt in this paper.

KEYWORDS: *Fading, Rayleigh, Rician, QAM, Simulink*

I. INTRODUCTION TO THE LINE OF SIGHT TRANSMISSION:

With any communication system, the signal that is received will differ from the signal that is transmitted, due to various transmission impairments. For analog signals, these impairments introduce random modifications that degrade the signal quality. For digital data, bit errors are introduced, a binary 1 is transformed into a binary 0, and vice versa. Some of the most significant impairments are attenuation and attenuation distortion, free space loss, noise, atmospheric absorption, multipath and refraction.

1.1 ATTENUATION: The strength of a signal falls off with distance over any transmission medium. For guided media, this reduction in strength, or attenuation, is generally exponential and thus is typically expressed as a constant number of decibels per unit distance. For unguided media, attenuation is a more complex function of distance and the makeup of the atmosphere. Attenuation introduces three factors for the transmission engineer. Firstly, a received signal must have sufficient strength so that the electronic circuitry in the receiver can detect and interpret the signal. Secondly, the signal must maintain a level sufficiently higher than noise to be received without error. Thirdly, attenuation is greater at higher frequencies, causing distortion. The first and second factors are dealt with by attention to signal strength and the use of amplifiers or repeaters. For a point-to-point transmission, the signal strength of the transmitter must be strong enough to be received intelligibly, but not so strong as to overload the circuitry of the transmitter or receiver, which would cause distortion. Beyond a certain distance, the attenuation becomes unacceptably great, and repeaters or amplifiers are used to boost the signal at regular intervals [2]. These problems are more complex when there are multiple receivers, where the distance from transmitter to receiver is variable. The third factor is known as attenuation distortion. Because the attenuation varies as a function of frequency, the received signal is distorted, reducing intelligibility. Specifically, the frequency components of the received signal have different relative strengths than the frequency components of the transmitted signal. To overcome this problem, techniques are available for equalizing attenuation across a band of frequencies. One approach is to use amplifiers that amplify high frequencies more than lower frequencies.

1.2 FREE SPACE LOSS: For any type of wireless communication the signal disperses with distance. Therefore, an antenna with a fixed area will receive less signal power the farther it is from the transmitting antenna [5]. For satellite communication this is the primary mode of signal loss. Even if no other sources of attenuation or impairment are assumed, a transmitted signal attenuates over distance because the signal is being spread over a larger and larger area. This form of attenuation is known as free space loss, which can be express

in terms of the ratio of the radiated power Pt to the power Pr received by the antenna or, in decibels, by taking 10 times the log of that ratio. For the ideal isotropic antenna, free space loss is

$$\frac{P_t}{P_r} = \frac{(4\pi d)^2}{\lambda^2} = \frac{(4\pi f d)^2}{c^2}$$

(1)

where Pt is the signal power at the transmitting antenna, Pr is the signal power at the receiving antenna, λ is the carrier wavelength, f is carrier frequency, d is propagation distance between antennas and c is the speed of light.

1.3 NOISE: For any data transmission event, the received signal will consist of the transmitted signal, modified by the various distortions imposed by the transmission system, plus additional unwanted signals that are inserted somewhere between transmission and reception. These unwanted signals are referred to as noise. Noise is the major limiting factor in communications system performance. Noise may be divided into four major categories as thermal noise, inter modulation noise, crosstalk and impulse noise. Thermal noise is due to thermal agitation of electrons. It is present in all electronic devices and transmission media and is a function of temperature. Thermal noise is uniformly distributed across the frequency spectrum and hence is often referred to as white noise. When signals at different frequencies share the same transmission medium, the result may be inter modulation noise [3]. Crosstalk can occur by electrical coupling between nearby twisted pairs or, rarely, coax cable lines carrying multiple signals. Crosstalk can also occur when unwanted signals are picked up by microwave antennas. Impulse noise, however, is non continuous, consisting of irregular pulses or noise spikes of short duration and of relatively high amplitude. It is generated from a variety of causes, including external electromagnetic disturbances, such as lightning, and faults and flaws in the communications system.

1.4 ATMOSPHERIC ABSORPTION: An additional loss between the transmitting and receiving antennas is atmospheric absorption. Water vapour and oxygen contribute most to attenuation. A peak attenuation occurs in the vicinity of 22 GHz due to water vapour. At frequencies below 15 GHz, the attenuation is less. The presence of oxygen results in an absorption peak in the vicinity of 60 GHz but contributes less at frequencies below 30 GHz. Rain, fog and suspended water droplets cause scattering of radio waves that results in attenuation. This can be a major cause of signal loss. Thus, in areas of significant precipitation, either path lengths have to be kept short or lower-frequency bands should be used.

1.5 MULTIPATH: For wireless facilities where there is a relatively free choice of where antennas are to be located, they can be placed so that if there are no nearby interfering obstacles, there is a direct line-of-sight path from the transmitter to receiver. This is generally the case for many satellite facilities and for point-to-point microwave. In other such cases, such as mobile telephony, there are obstacles in abundance [4]. The signal can be reflected by such obstacles so that multipath copies of the signal with varying delays can be received. In fact, in extreme cases, the receiver my capture only reflected signals and not the direct signal. Reinforcement and cancellation of the signal resulting from the signal following multiple paths can be controlled for communication between fixed, well-sited antennas, and between satellites and fixed ground stations.

II. A REVIEW ON RAYLEIGH AND RICIAN FADING CHANNELS

Rayleigh fading occurs when there are multiple indirect paths between the transmitter and receiver and no distinct dominant path, such as LOS path. This represents a worst case scenario. Fortunately, Rayleigh fading can be dealt with analytically, providing insights into performance characteristics that can be used in difficult environments, such as downtown urban settings. In the mobile radio channels, the Rayleigh distribution is usually used to describe the statistical time varying nature of the envelope detected at the receiver for a flat faded environment [6]. The Rayleigh probability density function (pdf) for a distributed envelope r(t) can be expressed as follows

$$p(r) = \{\frac{r}{\sigma^2}\exp\left(-\frac{r^2}{2\sigma^2}\right)\} for 0 \le r \le \infty$$

$$p(r) = \{0\} for r < 0$$

(2)

where σ is the rms value of the received voltage signal and σ^2 is the time average power at the envelope detector respectively. The probability that the received signal is up to a specified given value R can be given as follows

$$P(R) = p_r(r \le R) = \int_0^R p(r)dr \approx 1 - \exp\left(\frac{R^2}{2\sigma^2}\right)$$

(3)

Similarly, r_{mean} for such distribution is given as the following expression

$$r_{mean} = E[r] = \int_0^\infty rp(r)dr = \sigma\sqrt{\frac{\pi}{2}}$$

(4)

And the variance in Rayleigh distribution σ_R^2 (ac power in the envelope) can be derived as

$$\sigma_r^2 = E[r^2] - E^2[r]$$

(5)

$$\sigma_r^2 = \int_0^\infty r^2 p(r)dr - \frac{\sigma^2\pi}{2} = 2\sigma^2 - \frac{\sigma^2\pi}{2} = 0.429\sigma^2$$

(6)

The middle value of the envelope is more often useful for analysis of faded data under different fading distributions as sometimes the mean value varies widely. This middle value may be computed by treated P(R) as 0.5 and solving the following expression as follows

$$0.5 = \int_0^r p(r)dr$$

(7)

This provides r_m as 1.777σ, which differs slightly from the r_{mean} value. Sometimes the dominant non fading signal due to line-of-sight in the channel superimposes itself on the random multipath components. The effect of the dominant signal over the weaker multipath weaker signal gives rise to a Rician distribution. The Rician distribution degenerates to Rayleigh in the absence of a line of sight dominant signal.

The Rician (pdf) can be expressed as follows

$$p(r) = \{\frac{r}{\sigma^2}\exp-(\frac{r^2+A^2}{2\sigma^2})I_0(\frac{A_r}{\sigma^2})\} \quad \text{for } A \ge 0, r \ge 0$$

(8)

$$p(r) = \{0\} \quad \text{for } r<0$$

(9)

Here A is the peak amplitude of the direct Line of Sight (LOS) signal and $I_0(x)$ is the modified Bessel function of the first kind with zero order. The Rician distribution is described by a parameter K, which is the ratio between the direct signal power and the variance of the multipath. This may be expressed in dB as given below

$$K = 10\log\frac{A^2}{2\sigma^2}\,\text{dB}$$

(10)

This shows that for the absence of direct line-of-sight signal $K \to -\infty$ and Rician distribution degenerates into Rayleigh. In digital wireless systems, channel impairment due to fading is solved using error control codes, equalizers, or appropriate diversity schemes. Random fluctuating signals cause fades which randomly cross a given specific signal level.

III. QAM MODULATION SCHEME

QAM is a modulation scheme which communicates data by changing (modulating) the amplitude of two sinusoidal carrier waves, which are out of phase with each other by 90 degrees. Unlike MPAM or MPSK, which has one degree of freedom for encoding the information, MQAM encodes information in both the amplitude and phase of the transmitted signal. Thus, MQAM is more spectrally efficient by encoding more bits per symbol for a given average energy. Unlike MPSK, where all the M signals are distributed on a unit circle with equidistance, the output signals generated by the rectangular MQAM modulator are distributed on an orthogonal grid on the constellation diagram. The M symbols are gray-encoded. Three types of QAM constellations are popular, namely type –I, type-II and type-III constellations. The type-I (star) constellation places a fixed number of signal points uniformly on each of the N concentrated rings, where N is the number of amplitude levels. This is also known as star-QAM. The points on the inner ring are very close in distance, and

are thus most affected by errors. The type-II constellation improves the error performance of type-I, by decreasing the number of points on the inner circles, and making the distance between two adjacent points on the outer circles to be approximately equal to that on the inner circles. The type –III (square) constellation has a very small performance improvement over type-II constellation, but its implementation is much simpler.

Square MQAM is the most popular QAM scheme. It usually takes the form of a square constellation such as 4QAM, 16QAM, 64 QAM, and 256QAM. 4QAM is the same as QPSK. These constellations are more often used, due to the relative ease of their circuit implementation. Square MQAM implementation for 32 QAM, 128 QAM, and 512 QAM is also possible. The square QAM has a maximum possible minion mum Euclidean distance d_{min} among its phasors, for a given average symbol power. It is most appropriate for the AWGN channel. Star MQAM may also be used due to its relatively simple detector and lower PAPR [1]. Star MQAM can be treated as multi-level MPSK, each level having different amplitude. Although it is not optimum in terms of d_{min} under the constraint of average phasor power, it allows the use of efficient differential encoding and decoding methods. This makes it suitable for fading channels. The method of differential coding for star QAM is determined depending on the purpose, based on either avoiding carrier recovery or enabling differential detection of signals. Good constellation mappings may be hard to find for MQAM signals, especially for irregular constellation shapes. It may be also hard to find a Gray code mapping where all the symbols differ from their adjacent symbols by exactly one bit. An MQAM system requires a smaller minimum carrier-to-noise power ratio than an MPSK system does. A higher level of encoding requires a higher minimum carrier-to-noise power ratio. Gray codes are used to map binary symbols to phasor states in the constellation.

MQAM modulation is most widely used in various wireless systems. Lower-order QAM schemes have better cell overlap control and good tolerance to distortion, but lower spectral efficiency. Higher-order QAM schemes provide higher data rates at the cost of stricter C/N requirements, smaller coverage radii for the same availability, and hardware complexity, and more severe cell-to-cell interference. For satellite communication systems, QPSK is usually used in the uplink direction at a lower frequency channel, and MQAM is used in the downlink k direction at a higher frequency band. Due to the high spectral efficiency, MQAM are widely used in broadband wireless and satellite multimedia communication systems, such as DVB. In IEEE 802.11n, the 256 QAM modulations are used in order to achieve a data rate in excess of 600 Mbit/s. In WiMAX, adaptive modulation is applied, higher-order modulation being used for MSs that are closer to the BS. In LTE, QPSK, 16QAM, and 64QAM are used in the downlink. MQAM is also used in DVB-S/C/T.

IV. PERFORMANCE ANALYSIS OF RAYLEIGH AND RICIAN FADING CHANNELS USING QAM

The environment is created as shown in the fig. 1 and fig. 5 respectively using Simulink tool.

RANDOM INTEGER GENERATOR: The random integer generator generates random uniformly distributed integers in the range [0, M-1], where M is the M-ary number. INTEGER TO BIT CONVERTER: In the integer to bit convertor unit, a vector of integer-valued or fixed valued type is mapped to a vector of bits. The number of bits per integer parameter value present in the integer to bit convertor block defines how many bits are mapped for each integer-valued input. For fixed-point inputs, the stored integer value is used. This block is single-rated and so the input can be either a scalar or a frame-based column vector. For sample-based scalar input, the output is a 1-D signal with 'Number if bits per integer' elements. For frame-based column vector input, the output is a column vector with length equal to 'Number of bits per integer' times larger than the input signal length.

DIFFERENTIAL ENCODER: Differential encoder differentially encodes the input data. The differential encoder object encodes the binary input signal within a channel. The output is the logical difference between the current input element and the previous output element.

CONVOLUTIONAL INTERLEAVER: This block permutes the symbols in the input signal. Internally, it uses a set of shift registers. The delay value of the kth shift register is (k-1) times the register length step parameter. The number of shift registers is the value of the rows of shift registers parameter.

QAM MODULATOR BASEBAND: This block modulates the input signal using the quadrature amplitude modulation method. The block only accepts integers as input.

QAM DEMODULATOR BASEBAND: This block demodulates the input signal using the quadrature amplitude modulation method. For sample-based input, the input must be a scalar. For frame-based input, the input must be a column vector.BUFFER: The buffer converts scalar samples to a frame output at a lower sample rate. The conversion of a frame to a larger size or smaller size with optional overlap is possible. It is then passed to the multipath Rician fading

CONVOLUTIONAL DEINTERLEAVER: The Convolutional deinterleaver block recovers a signal that was interleaved using the Convolutional interleaver block.

DIFFERENTIAL DECODER: The differential decoder block decodes the binary input signal.
BIT TO INTEGER CONVERTER: The bit to integer converter maps a vector of bits to a corresponding vector of integer values. The number of bits per integer parameter defines how many bits are mapped for each output.
ERROR RATE CALCULATION: The error rate calculation is done by computing the error rate of the received data by comparing it to a delayed version of the transmitted data.
SIGNAL TRAJECTORY SCOPE: The discrete-time signal trajectory scope is used to display a modulated signal constellation in its signal space by plotting the in phase component versus the quadrature component.
SCATTER PLOT SCOPE: The discrete-time scatter plot scope is used to display a modulated signal constellation in its signal space by plotting the in phase component versus the quadrature component.
EYE DIAGRAM SCOPE: The discrete-time eye diagram scope displays multiple traces of a modulated signal to reveal the modulation characteristics such as pulse shaping, as well as channel distortions of the signal.
SNR ESTIMATION: The SNR estimation block gives the estimated SNR in decibels.
DISPLAY: This unit gives the total number of bits transmitted, the number of errors and finally displays the Bit Error Rate.

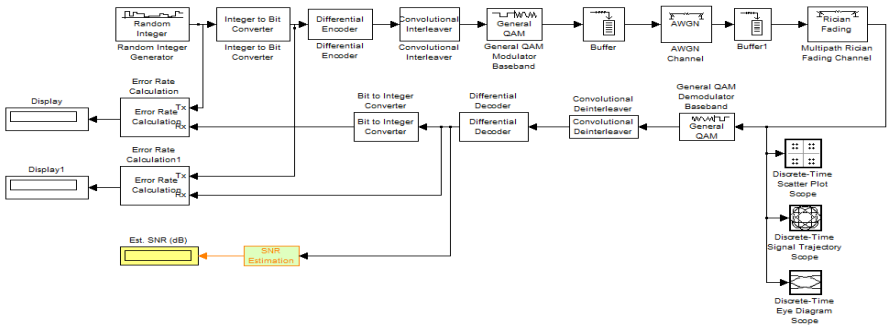

Fig. 1. Simulink Scenario for the Performance Analysis of Rician Fading Channels in QAM modulation

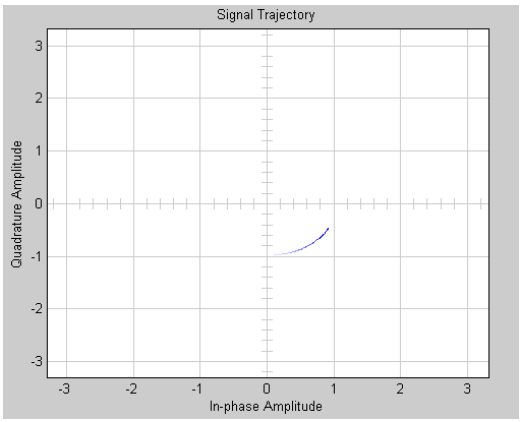

Fig. 2. Signal Trajectory for the Performance Analysis of Rician Fading Channels in QAM modulation scheme

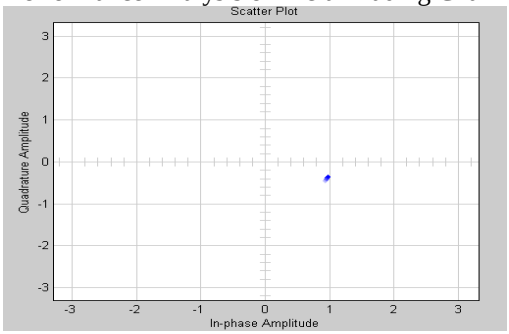

Fig. 3. Scatter plot for the Performance Analysis of Rician Fading Channels in QAM modulation scheme

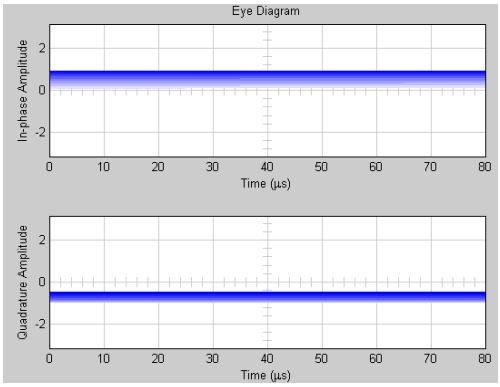

Fig. 4. Eye diagram for the Performance Analysis of Rician Fading Channels in QAM modulation scheme

Table 1. Bit Error Rate Analysis of Rician Fading Channels in QAM Modulation Scheme

RICEAN FACTOR	SNR	BER
600	300	0.02673
800	400	0.01986
1000	500	0.01982

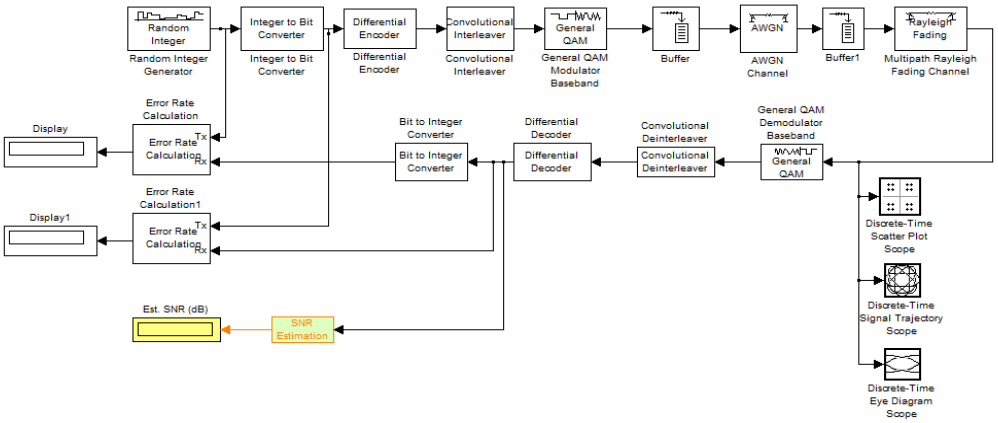

Fig. 5. Simulink Scenario for the Performance Analysis of Rayleigh Fading Channels in QAM modulation

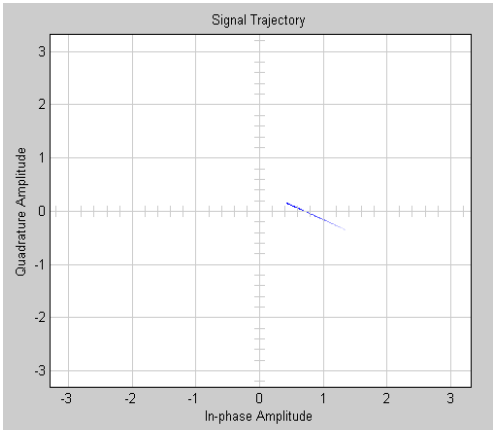

Fig. 6. Signal Trajectory for the Performance Analysis of Rayleigh Fading Channels in QAM modulation scheme

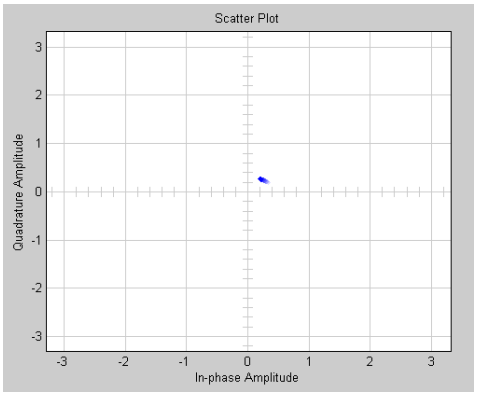

Fig. 7. Scatter plot for the Performance Analysis of Rayleigh Fading Channels in QAM modulation scheme

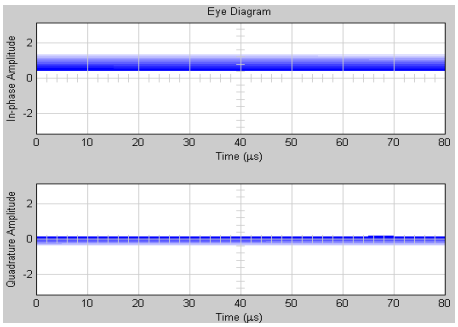

Fig. 8. Eye diagram for the Performance Analysis of Rayleigh Fading Channels in QAM modulation scheme

Table 2. Bit Error Rate Analysis of Rayleigh Fading Channels in QAM Modulation Scheme

SNR	BER
300	0.02020
400	0.01648
500	0.01123

IV. CONCLUSIONS

An introduction to the line of sight transmission followed by a review on Rayleigh and Rician fading channels is provided. It is apparent from table 1 that when the Ricean factor and Signal to Noise Ratio increases, the Bit Error Rate decreases gradually. Similarly from table 2 it can be inferred that when the Signal to Noise ratio increases, the Bit Error Rate decreases. It is observed from table 1 and table 2 that for a very high SNR a low bit error rate is achieved. The Quadrature Amplitude Modulation scheme can produce a very low bit error rate for the same signal to noise ratio in Rayleigh fading channels than in the Ricean fading channels. Future works may include the effective use of different modulation schemes in the Simulink scenario to produce a very low bit error rate.

REFERENCES

[1] L.Hanzo, M.Munster, B.J.Choi and T.Keller, *OFDM and MC-CDMA for Broadband Multi-User Communications, WLANs and Broadcasting* (New York: Wiley-IEEE, 2003)

[2] S.L.Cotton and S.G.Scanlon, Characterization and modeling of the indoor radio cannel at 868 MHz for a mobile bodyworn wireless personal area network, *IEEE Anten. Propagat. Lett.*, 6:1(2007), 51-55.

[3] K.Davies and E.K.Smith, Ionospheric effects on satellite land mobile systems. *IEEE Antenn. Propagat. Mag.*, 44:6 (2002), 24-31.

[4] Q.V.Davis and D.J.R.Martin, and R.W.Haining, Microwave radio in mines and tunnels. In *Proc. IEEE VTC*, Pittsburgh, PA, May 1984, 31-36.

[5] V.Erceg, L.J.Greenstein , S.Y.Tjandra, S.R.Parkoff, A.Gupta, B.Kulic, A.A.Julius and R.Bianchi, An empirically based pathloss model for wireless channels in suburban environments. *IEEE J.Sel. Areas Commun.*, 17:7 (1999), 1205-1211.

[6] A.Goldsmith, *Wireless Communications* (Cambridge, UK:Cambridge University Press, 2005).

Walking the Talk in Training Future Mathematics Teachers Has Potential for Benefits

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ABSTRACT

Culturally relevant mathematics instruction requires modeling of the multicultural theories in teacher training. Providing theory only to students about how to teach diverse students does not engage them in experiencing being on the other side except minority students. This study presents findings of theanalyses of teaching artifacts, curriculum and lecture observations of two teacher training classrooms of mathematics pedagogy. The observations alone could not account for the rationale behind individual practices, hence students' experiences and syllabi of these two classrooms triangulate the observations to strengthen the analysis. The findings indicate that the "otherness" of diverse ways of knowing continue to prevail regardless of all efforts on informing mathematics teacher education about cultural affirming instruction. Also teacher trainer's theoretical framework on multiculturalism determines the nature of mathematics teacher education student teachers' will be exposed to.

I. INTRODUCTION

A global acknowledgement has been made that every student should access quality mathematics education because mathematics is a pillar of civilization practically and aesthetically. However, students are still failing in their mathematics courses and many teachers do not understand it either (Bishop, 1997, Schmidt et al, 2011; Hsieh et al., 2011). Hsieh, et al. (2011) suggest that teachers from low performing countries in TIMSS score very poorly in mathematics knowledge even lower than their countries' primary school students. This failure in students' mathematics performance doesn't only reflect lack of motivation but also reflects societal factors of injustice (Pewewardy, 2002). It has been noted that teaching and learning generally is affected by cultural differences, linguistic heritage, learning environments, experience and heredity (Pewewardy, 2002; Zhang and Kenny, 2010). It is therefore important to reconstruct student teachers' traditional experiences of learning mathematics to authentic understandings that, diverse learners bring diverse experiences into the classroom that need to be incorporated to their learning as their foundational cultural capital. These diverse experiences need to be embraced and brought forward during instruction to bring plural strategies of enriching intellectual mathematical learning. Moses- Snipes (2005) asserts that mathematics teaching should support learning of all students (NCTM, 2000) to increase performance in mathematics for all students. Inclusion of students' life experiences and culture in mathematics instruction should be the daily learning practice (Kersaint and Chappel, 2001). This paper aims to assess teaching practices that pre-service teachers are exposed to during their training in college with special reference to multicultural experiences in mathematics training. Teacher education has to prepare teachers that perceive diversity as a rich component of learning (Villegas and Lucas, 2002). Therefore, it is crucial to help teachers, from all backgrounds, to acquire the appropriate attitudes, knowledge, and dispositions to work effectively with students that come from diverse background (Tiedt and Tiedt, 2002; Villegas and Lucas, 2002).

Vygotsky (1978) suggests that construction of meaning happens when the external factors are internalized. These external factors are different in different cultures. Austin and Howson (1979); Feza and Webb (2005) confirm the major difference in mental preparation for mathematics learning between a learner whose language that is close to Greek-Roman terminology and the learner whose language is completely different. Teacher education should therefore prepare teachers well for these diverse assets brought by student's diversity in mathematics classroom. Instead of using children's language and culture as barriers to learning we need to learn that they are the rich foundations for learning. Setati, (2002. 2005), and Feza & Webb (2005) highlight the importance of mother tongue instruction in mathematics learning and teaching. However, little attention has been given on the cultural aspect of learning mathematics that is embedded in language in training

of teachers. This paper examines in-depth what teacher training colleges do in addressing the cultural aspect of mathematics instruction with a focus on one institution in Western New York. In doing so, a theoretical framework on multicultural pedagogy in the mathematics teaching and learning is discussed followed by the methodology used in this investigation. The results are then deliberated on individual classroom cases and a concluding argument finalise the paper.

II. THEORETICAL FRAMEWORK

This study focuses on mathematics student teachers 'multicultural experiences and exposure during their teacher education training. Ladson-Billing (2000); Jackson & Wilson (2012) suggest that "literature does not expressly address the preparation of teachers to teach African American learners effectively" (p.206). Therefore this study aims at observing teacher preparation to see if it does prepare teachers to teach minority students inclusively. Bennet (2001) suggests four clusters of multicultural education that encompasses the comprehensive multicultural education. The clusters are curriculum reform, societal equity, equity pedagogy, and multicultural competence. Relevant to this study is the equity pedagogy that reflects on multicultural teacher education curriculum and cultural styles in teaching and learning of mathematics that this paper investigated.

2.1. Multicultural teacher education curriculum

Most of the curriculum offered in mathematics teacher education (MTE) has been revealed as not multicultural (Banks, 2004a, 2004b; Grant and Sleeter, 2006) instead the MTE embraces diversity as the "other" which is suggested to be the infant stage of "multicultural practice" (Gorski, 2009). This celebration of multicultural education falls short in committing to social justice and educational equity (Cochran-Smith, 2004; Jackson, 2003; McKenzie and Scheurich, 2004). Gorski (2009) recommends that MTE curriculum alone cannot represent what happens when the classroom door is closed behind the professor. He further asserts that what happen in a mathematics teacher education classroom is influenced by the lecturer/professor's deeply politicized structures. Three theoretical multicultural frameworks that influence multicultural practices have been identified by researchers as theoretical frameworks that influence teacher trainers' and educators' practices. The frameworks are: conservative multiculturalism; liberal multiculturalism and critical multiculturalism (Jenks et al., 2001).

2.2. Conservative multiculturalism

Conservative multiculturalist compels themselves in addressing inequities by acculturating minorities or others to their dominant culture (Jenkins et al., 2001). They perceive their marginalizing culture as the one that will liberate the marginalized by conforming to it (Grant and Sleeter, 2006). Their commitment goes with those who are willing to be acculturated to the mainstream culture and to them "equality comes through social mobility" (Gorski, 2009, 311). Therefore, ideas of minority students cannot play any role in knowledge construction in this kind of ideological environment.

2.3. Liberal multiculturalism

Liberal multiculturalist celebrates difference with "insufficient attention on power, privilege and control" (Gorski, 2009, 311). They embrace diversity programmes but disregard access consequences of difference (Gorski, 2009). The environment created by this approach will accommodate diversity as it sees the need without giving minority an equal floor in contributing to learning or changing the status quo of the dominant culture. The dominant culture continues to inform learning and teaching practices. Power relations are not addressed at all.

2.4. Critical multiculturalism

Critical multiculturalist challenges supremacy, questions traditionally dominant culture and empowers teachers to understand their role within a sociopolitical context (Jenks et al., 2001). Grant &Sleeter (2006) argues that this approach is a social reconstructionist approach with a responsibility to "reconstruct schooling in ways that dismantle rather that reify, social stratification" (p.311). This kind of environment is expected to eliminate dominant culture and support pluralism by emancipating students (Gorski, 2009).

2.5. Cultural styles in teaching and learning

The role of the instructor or professor has been highlighted as significant in nurturing student teachers for cultural relevant mathematics teaching and learning (Gorski, 2009). MacNaughton and Hughes (2007) cited five practices that research proposes to be included in teacher training from (Brown, 2004, Brown et al, 2000 and MacNaughton and Davis, 2001; Dee and Henkin, 2002). These practices are to:

- Acquaint student teachers to diverse cultural groups and experiences.
- Increase understandings of the supreme groups about effects of discrimination
- Provide time for study of cultural diversity principles and instructional practices
- Plan thoughtful approaches and permitting time for detecting and discovering the dominant group's opposition to cultural diversity principles and pedagogical practices
- Allow time for student teachers to reflect disparagingly on their present social location and on their experiences of cultural marginalization

Lowenstein (2009) proposes that student teachers' are nurtured to view diverse knowledge brought by diverse students as rich legitimate knowledge students come with to school. She then advocates for teacher training that models similar practices instead of treating student teachers as empty slates on issues of diversity but let them bring forward their theoretical frameworks of multicultural instruction.

III. METHODOLOGY

Twelve classroom observations of each of the two mathematics pedagogy classes were conducted over the semester on a Masters' programme of mathematics education at a University in Western New York. These lesson observations for both classes added up to 24 observed lessons. One of the two classes focused on mathematics curriculum from pre-K-12 and the other class focused on geometry education from 5th-12th grade. The diversity of students in these courses is of high importance for the study and therefore, is distinguished. Class 1 consists of 25 students from diverse backgrounds with international representation while class 2 consists of 9 Caucasian students with no other ethnic groups. The students relationship with their trainers was observed based on caring, respect, and trust facilitating learning (Alport, 1954 & Schofield, 1995) cited by (Bennet, 2001). Therefore an ethnographic approach was employed to observe the classroom climate, relationships and multicultural opportunities to learning. The second stage was observing theoretical frameworks that influence teaching practices and cultural relevant artifacts used in these classrooms and therefore the appropriateness of the curriculum is examined (Jenkins et al (2001) and Grant and Sleeter, 2006). This was done by examining syllabus and pre-scribed materials for the class and also all articles involved. The syllabus was evaluated to examine if its role and purpose in creating an environment that embraces diversity and challenges dominant cultural practices. A triangulation of data with theory analysis approach is conducted in this data. For example the analysis of the syllabus uses the National Council of Teachers of Mathematics (NCTM) recommendations on how to teach, Vygotskian theory on how learning takes place and the multicultural theory based on D'Ambrosio's work on multicultural mathematics education. The analyses of classroom observation notes use Kitchen's research on how to facilitate pedagogy on multicultural education together with Grant and Sleeter and Gorsi's research on the multicultural education pedagogy theoretical framework.

IV. RESULTS

Out of the two classrooms I observed one is dominated by teacher centered instruction while the other is dominated by high student participation. Therefore, presenting the data collected from these two classrooms will not be integrated but separated. The data will be identified by class 1 and class 2 respectively, with the purpose of drawing a clear picture of each classroom.

Class 1

A class of 25 students doing their master's degree in teacher education enrolled for a mathematics course that focuses on improving Elementary Math Instruction. The course's purpose is to develop mathematical content, mathematics pedagogy, curriculum, attitudes and power; and collaboration amongst students. For this paper I will focus on the development of mathematics pedagogy with the aim of responding to the question of the study. Which is **"**How does teacher training prepare in-service teachers for culturally relevant mathematics classrooms?" According to the syllabus of this class developing mathematics pedagogy means: "Students will select and use effective teaching practices appropriate for elementary mathematics instruction in an effort to create a positive and productive learning environment"(p.2).The statement of the syllabus reveals that the course's pedagogical aim which is effective teaching practices and appropriate instruction. It is clear that this course is guided by the National Council of Teachers of Mathematics (NCTM, 2000) s recommendation that teachers utilize the cultural and educational background knowledge of their learners as a way to help them learn mathematics and make connections to other academic field. The course description of the mathematics pedagogy emphasizes the strategies that focus on "students mathematical thinking as the construction ofideas, the application of mathematics in students' lives, and the integration of mathematics with other academic disciplines" (p.2). This statement supports socio-constructivist theory of Vygotsky (1978) that students' learning

occurs when external tools have become internalized and become understood ideas. Therefore, these ideas then are used in real life experiences and also connected to other areas of learning because they have been internalized. Focusing on students mathematical thinking in construction of ideas means acknowledging and connecting students' ideas that already exist to the new ideas to bring understanding of the unknown.

One of the objectives of the course states that the students "will create instructional activities that will improve learning opportunities for all students, regardless of race, gender, ethnicity, socio-economic status" (p.2). D'Ambrosio (1995) supports this course's purpose by defining how new knowledge is built. He suggests that learners' practices that involve their cultural practices and their perceptions are the foundation where new ideas could be built from. If these new ideas cannot be linked with the learner's cultural foundation then development is impeded. Vygotsky's (1978) comparison of external tools that need to be internalized through construction of meaning before they are realized elaborates D Ambrosio s words that "practices and perceptions of learners are the sub stratum on which new knowledge is built". By this Vygotsky means sense making is a process that connects what is known to the unknown and then the unknown becomes known. According to the multicultural theoretical framework this objective recognizes the need for equal opportunities without a plan to change the mainstream ideology (Grant and Sleeter, 2006).

Examining this course's text which is NCTM Principles and Standards for School Mathematics (PSSM) the purpose of this course is presented well by the PSSM documents as it advocates for equity (NCTM PSSM, 2000). The PSSM equity principle promotes "high expectations and worthwhile opportunities for all" (p.12). The opportunities that are promoted by NCTM are not uniform for all but "they require accommodating differences to help everyone learn mathematics" (p.13). The class observed consists of 25 students with diverse backgrounds. One student is from Kenya in Africa, one from South Africa, one from China, one male from Pakistan, and 21 students are all Caucasians from the US. Out of the 21 US students only two are males the majority is females even those from other countries there is one male. This diverse classroom presents rich opportunities for learning other people's ways of knowing, and also understands other people's perspectives of what mathematics education should entail. The course text and the classroom diversity had potential to bring forward the framework of liberal multiculturalism. This course objective embraced diversity and pluralism, however there is no rigorous plan in the syllabus to dismantle the traditional dominating culture nor for implementing cultural relevant pedagogy.

Classroom practice of class 1 presented a different story compared to the curriculum. There was very little interaction among students in this class as most of the instruction is done by the instructor. For example, using an example from day to day approach, the instructor was standing in front of two rows with students facing one another in each row forming four rows, she gave students' a verbal summary of an article she wanted them to read and the name of the article was "Running ahead: Mathematically Desirable and Accesible". Then, she told the class how she approached division in class and one kid couldn't do it because the kid said "Only even numbers can be factors, no odd numbers can be factors". Then she asked if students have bad math stories. By that she meant stories of teachers teaching wrong mathematics or difficult experiences teachers have. One student narrated this story: "I had home school girls that were brought in to my class to learn. They have never been in a school environment before. They could not do any math at all, and could not interact freely with others. They read but couldn't do their mathematics".

This student's story lays ground for a rich discussion because this is a real experience that these students face and need to find approaches of dealing with them. However, no discussion took place after the student teacher brought the story forward. Only two students responded with bad math stories. Then the instructor wrote a division problem in the board and asked students "How do you do this?" Then students in a choral way lead the instructor what to write: 19√1526 which was 8 on top of 2 and 152 below 152 and subtract the answer is 0 drop 6 and put 0 on top of six and put 0 below the dropped 6 and subtract and the difference is six. Then the instructor asks "What is six? How do you deal with six in a different context then she asked if people from other countries do the same. Then the Kenyan student stated that they will put zero on top of 1 and a zero on top of 5 before 80 in Kenya. While the South African student noted that they use dots before the number instead of zeros. After this the instructor presented how the kids would do it. Then one student was concerned and asked "Can we allow them to do it their own way what about testing? They won't be penalized?" Then the instructor put on slides of a paper on international research of Geometry leaving the division problem hanging. She also showed a video lesson of 4 year old Caucasian learners. The instruction on the video tape was more active and the teacher guided learning by using "Why" questions on this tape. Children were verbalizing their thinking and challenging one another. This is the format of the observations I had with this class. Most instruction is teacher centered. The instructional method of this class is influenced by the conservative

multiculturalism that believes that by allowing students to share their ways of doing mathematics and driving them to do it the mainstream way which is the American way in this case. Allowing students to share their diverse ways of doing mathematics algorithm stood alone with no follow ups. However, the American way of doing the algorithm was the one given more attention.

Again the rich question about (testing?) culture in schools is not addressed in this class. In US schools, teachers find themselves teaching for the test because of the pressures put on them when learners do badly on State tests (Feza, 2013). This is another opportunity that went unattended as some students might have come up with ideas on how to manage tests and continue having effective instruction. So the possibilities were endless but we'll never know because this teacher trainer did not follow up these opportunities. Kitchen (2005) hypothesizes three contributions that guide effective multicultural teaching. Those contributions are: "Creating a respectful and trusting community of learners, contributions of diverse cultures to mathematics, and considering students' cultures in the mathematics classroom" (p.41 & 42). Kitchen (2005) states that teacher educators need to model multicultural teaching when preparing teachers for their career. Another example was on use of mathematical terminology on shapes lesson when international students were calling an American trapezoid "trapezium". The instructor's response to this was "I will stick with American way and call it, trapezoid". When one student asked her why should teachers teach different approaches in solving problems? Why can't they allow learners to bring their own?" The instructor's response was "Some schools use everyday math especially well off schools, therefore teachers have to teach those approaches". This is contradictory to what the course aim to achieve. However, it is an indication of how important mainstream practices are. This practice continues to exclude minority students in active participation and construction of meaning as well as it will exclude minority children in their prospective classrooms. Although, there has been a lot of literature that advocates for cultural relevant mathematics education Grant and Sleeter (2004) state that theoretical framework of multicultural pedagogy vary for different instructors and influence their practices. The "assimilationist sociological accounts" Gorski (2009) still influence this classroom as students have to do things the dominant American way, divide the dominant American way and use the dominant American vocabulary as the instructor proposed. The melting pot theory still rules this classroom as it Americanizes all students regardless of their backgrounds.

Class 2

This class consisted of nine Caucasian students that were six males and three females. It was a methods course for teaching mathematics in grades five to twelve. The main course objective is "to prepare students with solid mathematics pedagogical knowledge to be middle school and high school mathematics teachers". The success of this course is continuously assessed when students become more knowledgeable of and experienced in the techniques of teaching mathematics; realize the responsibility and workload that a teacher carries; relate national and state standards to mathematics curriculum; be aware of resources for mathematics teachers; determine a theoretical base for their personal mathematics instruction (p.5).This class is characterized by student participation and an instructor who works as a co-learner most of the time. On both observations the learning is led by students who are dressed formally presenting well prepared lessons with relevant manipulatives. Students sit in an oblong shape facing the presenter and discussing their work in pairs. An example of the day to day instruction of this class, two students presented one male and one female.

The first presentation was conducted by the male students who handed out worksheets to students. Then he demonstrated his instructions using an overhead worksheet. The objective of the lesson was "to visualize and compare different slopes using multiplication tables" for grade 7-8 learners. He demonstrated using an 8 times table then asked students to create their own tables and graph them. Then they filled in the worksheet formulating their own equations. They swapped their work and marked each other. Those who scored high marks received candies. Then he gave out another assessment activity and those students who scored high marks again received candy. Unfortunately one group scored high marks on both occasions and then the teacher gave others consolation prizes of candies for their attempt. At the end of this lesson all students including the instructor took evaluation forms and assessed the presentation. The presenter had to evaluate himself too during the evaluation moment.

The second presentation was conducted by a female student on Conjunction and Disjunction (mathematics logic). She started by introducing meanings of the terminology used in the lesson and handed out notes with examples. In her notes Conjunction was described as the use of the word "AND" in combining two simple sentences to form a compound sentence. A symbol "^" read as "and". An example she gave states that "P: Arthur reads the newspaper. Q:Patty went to the store. A compound sentence would be Arthur reads the newspaper AND Patty went to the store. In a symbolic manner it is written as P^Q". Describing Disjunction she

stated that "it is when the word OR (symbol v) is used to combine two simple sentences to form a compound statement". Her example was "P: Ronald plays basketball. Q: The park is closed. Then the compound sentence will be PvQ: Ronald plays basketball OR the park is closed". She then gave students statements to determine whether they are conjunction or disjunction, or neither. She asked them to work in pairs. Her presentation was developmental because after she allowed students to practice their understanding of Conjunction and Disjunction she developed truth tables with them. She asked them to use the truth tables to complete worksheets she handed out. Students showed lots of enthusiasm during this session and actively participated throughout. Students evaluated the lesson and then the instructor took over by revisiting the plan for the day. Both examples above show the mainstream practices of a classroom that is monocultural because of the type of student representation. Also the presentations did not indicate any need to go beyond the audience and think about diverse students.

Students had readings from the book "Secondary Classroom Management by Carol Simon Weistein" pages 1-124 that consists of chapters one to six. Written in a dynamic, likeable, colloquial style, it pools what research has to say about effective classroom management with knowledge picked from practice. This manuscript centers on real decisions made by real teachers as they manage the multifaceted environment of the secondary classroom. The manuscript assimilates the rational and the concrete management practices of five real secondary school teachers into debates of research-based management principles.

The instructor asked students to respond to her question that asked" Which teacher do they relate to the best? Why? Students responded that they were not happy with Carmen Sanchez class because it was not structured and she had little time for hands on work. Then the instructor referred the students back to the reading concerning Carmen Sanchez limitations on doing hands on work in her classroom. Students admired Fred Cerequas (social studies teacher) "because he keeps up with current issues and is young at heart. He is also spontaneous and knows how to jump in and improvise all the time". However, students acknowledge that his kind of attitude needs experience and wisdom that develops with experience and therefore prefer Sandy's approach that will work for some students. Each student was allowed to discuss his/her choice and support it. Then a general discussion on when to be strict emerged. Students reached a consensus on not to start in a relaxed mode to being strict because it causes chaos. They agreed that starting strict and loosening up little by little works better. They also agreed in using (p.73) model of teacher behavior and (p.53) principles for planning classroom rules. Westein (1996) exposes pre-service teachers to the diversity experienced by teachers in a variety of schools. The stories shared by individual teachers give a rich theory to upcoming teachers. In this activity teachers are allowed to make their choices according to their own teaching styles and beliefs, a good place to start in introducing change. Their comments reveal that they are aware of their limitations and strengths and therefore choose teachers that are close to them inexperience and aim to reach wisdom through their experiences.

Another example was when I arrived ten minutes before the beginning of the class. All students and their instructor were already in class. They have already organized the room to suite their presentations and their materials. The class started like the other classes with a slide that guided the day's plan. The two presenters had a sound knowledge of their mathematics. They used manipulatives to build mathematical understanding. They all promoted active participation and construction of meaning. In the first presentation one of the students commented after completing and solving a problem and said "it was like a magic when I solved the problem". The other students felt it was easy while the third group was surprised by the graph they used in solving the problem. In the second lesson the student managed to capture students' interest using tessellation of shapes in teaching geometry. Students were proud of their constructions and patterns they designed. Success, pride, esteem and high expectation compel the climate of this class. The three contributions that are suggested by Kitchen (2005) are practiced in this classroom. Students' ideas are respected and heard. Knowledge is socially constructed (Vygotsky, 1978) and different learning styles areexplored a weakness in this case. In general two NCTM (2000) principles guided instruction in this class. The equityand teaching principles together propose strong support for all children and understanding ofstudents' knowledge with high expectations.

V. DISCUSSION

Diverse classrooms are growing with time and therefore mathematics teacher education has to face the challenge. Class 1 confirms the claim made by MacNaughton and Hughes (2007) that mathematics teacher education continues to encourage the dominant form of training teachers with no success to endorse respect for diversity. The instructor is influenced by the conservative multiculutural theory of acculturating minorities to the mainstream ideologies and practices. Already the voices of student teachers in this class are deafened therefore; have to be changed to the dominant way of knowing (Jenkins et al., 2006). The relationship developed by this kind of instruction is authoritarian relationship that continues to marginalise minorities. On the other hand the

syllabus and materials used in this class embrace diversity. They fall short in proposing a rigorous plan on the implementation of a cultural relevant pedagogy.

Class 2 portrayed dynamic relationships between the instructor and students. Roles were shared amongst class participants. Students became instructors more often, and the instructor became a co-learner. Co-operative learning dominated this classroom practice and students' ideas were valued. The instruction in this classroom models a healthy platform to integrate a culturally affirming instruction. The relationships are of mutual respect, trust and caring nature. However, curriculum does not cater for multiculturalism combined with the instruction but the text used embraces diversity and expose student teachers to the diverse experiences teaching holds. Therefore the syllabus and instruction employ a monocultural environment while the text brings in liberal multiculturalism.

In summarizing Class 2 practices multicultural education here is treated as the "other" not the part of the whole process of learning (Gorski, 2009). These findings indicate that both classes embraced the dominant culture in their practices. The difference between the two classrooms was the relationships amongst teacher trainers and student teachers. Class1 indicated an authoritative relationship while class 2 indicated a respectful, dynamic kind of relationship. Both classes acknowledge diversity but lack rigorous approach towards educating for justice.

VI. CONCLUSION

Having been informed by most studies that diversity is the globally increasing, the ill preparation of teachers for the diverse mathematics classroom will cost education money, time and pride (Wiest, 2001).Voices of the minority societies are becoming louder and therefore teachers who have not acquired appropriate knowledge, skills, and attitude to teach from a mathematics multicultural perspective (Wiest, 2001). This will not only challenge teachers but colleges that train teachers need to reflect on their practices whether they are future oriented or stagnant. College reputations will be at stake. Mathematics is a controlling filter as it functions as a requirement to many fields of study, who has this power determines the future (Herzig, 2005). Therefore, it should be the priority of teacher education to allow access to learning of mathematics. Diversity enhances the academic environment of learning hence other ways of knowing become crucial elements of this environment to enrich it further. Diversity in an economic obligation and ignoring it has been proven to be costly to those societies (Herzig, 2005). The findings of this study reveal that the "otherness" of diverse ways of knowing mathematics continues to be the case in mathematics teacher education regardless of all efforts and literature out there. Therefore, public debate on teacher education should be on creating new ways of preparing mathematics teachers for a diverse society. Reforming the old ways continue to produce mediocre mathematics performance and practices.

REFERENCES

[1] Austin, J. L. &Howson, A. G. (1979).Language and mathematical education. *Educational Studies in Mathematics*, 10, 161-197.
[2] Banks, J, (2004a). *Multicultural education: characteristics and goals*. In J. Banks, & C. Banks (Eds). Multicultural education: Issues and perspectives, 3-30, San Francisco, CA: Jossey-Bass.
[3] Banks, J. (2004b). *Approaches to multicultural curriculum reform*. In J. Banks & C. Banks (Eds). Multicultural education: Issues and perspectives, 242-264, San Francisco, CA: Jossey-Bass.
[4] Bennet, C. (2001).Genres of research in multicultural education. *American Research Journal*, 71(2), 171-217.
[5] Bishop, A.J. (1997). The relationship between mathematics education and culture. Opening address delivered at the Iranian Mathematics Education Conference in Kermanshah,Iran.
[6] Cochran-Smith, M. (2004).*Walking the road: Race, diversity, and social justice in teacher education*. New York: Teachers College Press.
[7] D'Ambrosio, U. (1995). Multiculturalism and Mathematics Education. *International Journal of Mathematics Education, Science and Technology*, 26(3), 337-346.
[8] Feza, N & Webb, P. (2005). Assessment standards, Van Hiele levels and grade seven learners
[9] understandings geometry. *Pythagoras* 62, 36-41.
[10] Feza, N. (2013). Looking beyond the Gap of African American students' performance: States Test and Text book driven curriculum unskill mathematics teachers. *International Journal of Research and Reviews in Applied Sciences*,14(1), 90-99.
[11] Gay, G. (2000). *Cultural responsive teaching: Theory, research and practice*. New York, NY
[12] Teachers College Press.
[13] Gorski, P.C. (2009). What we're teaching teachers: An analysis of multicultural teacher education coursework syllabi. *Teaching and Teacher Education*, 25, 309-318.
[14] Grant, C. &Sleeter, C. (2006).*Turning on learning: Five approaches to multicultural teaching plans for race, class, gender, and disability*. Upper Saddle River, NJ: Prentice-Hall.
[15] Herzig, A. H. (2005). Goals for Achieving Diversity in Mathematics Classrooms. *Mathematics Teacher*, 99(4), 253-259.
[16] Hsieh, F., Law, C., Shy, H., Wang, T., Hsieh, C., & Tang, S. (2011). Mathematics Teacher Education Quality in TEDS-M: Globalizing the Views of Future Teachers and Teacher Educators, *Journal of Teacher Education*, 62, 172-187
[17] Jackson, W. (2003).*Crystalizing my multicultural education core*. In G. Gay (Ed), Becoming multicultural educators: Professional journey toward professional agency. 42-66. San Francisco, CA: Jossey Bass.
[18] Jackson, K. & Wilson, J. (2012).Supporting African American Students' Learning of Mathematics: A Problem of Practice, *Urban Education*, 47(2), 354-398.

[19] Jenks, C., Lee, J. O., &Kanpol, B. (2001). Approaches to multicultural in preservice teacher education: philosophical frameworks and models for teaching. *Urban Review*, 33(2).87-105.
[20] Kersaint, G & Chappell, M, F. (2001). Capturing Students Interests: A Quest to Discover
[21] Mathematics Potential. *Teaching children mathematics*, 7(9), 512-517.
[22] Kitchen, S. R. (2005).Making Equity and Multiculturalism Explicit to Transform Mathematics Education. In A. J, Rodriguez & R. D, *Kitchen (Eds.), Preparing Mathematics and Science Teachers for Diverse Classrooms.* Lawrence Erlbaum Associates Inc.
[23] Ladson-Billings, G. (2000). Fighting for our lives: Preparing teachers to teach African American students. *Journal of Teacher Education*, 51, 206-214.
[24] Lowenstein, K. L. (2009). The Work of Multicultural Teacher Education: Reconceptualizing White Teachers Candidates as Learners. *Review of Educational Research*, 79(1), 163-196.
[25] McKenzie, K. B., &Scheurich, J. J. (2004). Equity traps: a useful construct for preparing principals to lead schools that are successful with racially diverse students. *Educational Administration Quarterly*. 40(5), 601-632.
[26] McNaughton, G.,& Hughes, P. (2007). Teaching respect for cultural diversity in Australian early childhood programs: a challenge for professional learning. *Journal of Early Childhood Research*, 5(2), 189-204.
[27] Moses-Snipes, P. R., & Snipes, V. T. (2005). The call: The importance of research on African
[28] American issues in mathematics and science education. *Negro Educational Review*,
[29] 56(2/3), 103-105.
[30] National Council of Teachers of Mathematics (2000).*Principles and Standards for school mathematics* .Reston: Author.
[31] Pewewardy, C. (2002). Learning styles of American Indian/Alaska Native students: A review of the literature and implications for practice. *Journal of America Indian Education*,41(3).
[32] Setati, M. (2002). Researching Mathematics Education and Language in Multilingual South Africa. *The Mathematics Educator*, 12 (2), 6-20.
[33] Setati, M. (2005). Mathematics education and language: policy, research and practice in multilingual South Africa. In R. Vithal, J. Adler, & C. Keifel (Eds.), *Researching mathematics education in South Africa: Perspectives, practices and possibilities.* Capetown, South Africa: HSRC Press.
[34] Schmidt, W. H., Cogan, L., & Houang, R. (2011). The Role of Opportunity to Learn in Teacher Preparation: An International Context. *Journal of Teacher Education*, 62, 138-153.
[35] Tiedt, P. &Tiedt, I. (2002).*Multicultural Teaching: A Handbook of Activities, Information,*
[36] *and Resources.* (6th ed). Boston, MA: Pearson Education Company.
[37] Villegas, A., & Lucas, T. (2002).Preparing Culturally Responsive Teachers: Rethinking Curriculum. Journal of Teacher Education, 53(1), 20-32.
[38] Vygotsky, L. S. (1978). *Mind in Society*. MA: Harvard University Press.
[39] Wiest, L. R. (2001). Teaching mathematics from a Multicultural Perspective .*Equity &*
[40] *Excellence in Education*, 34(1), 16-25.
[41] Zhang, F., & Kenny, R. F. (2010). Learning in an Online Distance Education Course; Experiences of Three International Students. The International Review of Research in Open and Distance Learning, 11(1), 17-36.

Experimental Investigation of Multiwalled Carbon Nanotube Reinforcement in the Metal Matrix Composites for High Value Fatigue Life

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ABSTRACT

The present work shows that the addition of small volume fractions of multi-walled carbon nanotubes (CNTs) to the matrix results in a significant increase in the high-cycle fatigue life. It is proposed that carbon nanotubes tend to inhibit the formation of large cracks by nucleating nano-scale damage zones. In addition, the contribution to energy absorption from the fracture of nanotubes bridging across nano-scale cracks and from nanotube pull-out from the matrix are mechanisms that can improve the fatigue life. An energy-based model was proposed to estimate the additional strain energy absorbed in fatigue. The distributed nanotubes in the matrix appear to both distribute damage as well as inhibit damage propagation resulting in an overall improvement in the fatigue strength of glass fiber composites.

KEYWORDS: *carbon nanotubes, fatigue life, strain energy, metal matrix composites, thermosetting polymers, epoxy resins, cyclic stresses.*

I. INTRODUCTION

Glass fiber composites have high strength and low cost, but suffer from poor performance in fatigue. The underlying mechanisms in high-cycle fatigue failure of glass fiber composites are primarily related to matrix-dominated damage accumulation and growth that coalesce and propagate to the fibers resulting in ultimate failure.Prior fatigue studies of continuous and aligned glass fiber composites have shown that high-cycle fatigue life is dominated by fatigue cracking in the matrix that subsequently propagate and rupture the fibers. Once a significant number of fibers fracture, the composite laminate fails shortly thereafter. Unlike in high modulus carbon fiber composites, the low modulus of the glass fibers results in the imposition of high strains in the matrix leading to matrix fatigue failure . In these studies, failure was defined as the number of cycles when a prescribed loss of stiffness is attained. A recent review of fatigue theories is given in the following technical material. Stiffness reduction is an index of damage in composites and has been studied extensively both theoretically and experimentally. However, crack propagation and the resulting loss in stiffness is only a gross overall indicator of damage in composites. Damage can be generated well before microscopic-level crack initiation and micro crack coalescence occurs. Other studies have focused on measuring the fracture energies involved in crack propagation in composites, particularly in delamination fracture, a common failure mode [5]. Such studies show that a single crack that propagates in the matrix or fiber/matrix interface in a composite is associated with a low level of absorbed fracture energy.

In typical composite laminate configurations designed to carry structural loads under cyclic conditions, carbon fiber composites show little degradation with load cycling compared to glass composites. The explanation for the low degradation rates for carbon composites lies in the fact that the higher modulus of carbon fiber results in a low level of cyclic strain imposed on the matrix. A critical strain in the matrix corresponding to the fatigue strain of the matrix at the corresponding applied composite stress was identified as the critical parameter in fatigue failure of the composite. In glass composites, the applied cyclic strain in the matrix exceeds the corresponding fatigue strain in the neat resin, while in higher modulus composites such as carbon fiber composites; the applied cyclic strain in the matrix is below this critical value. Thus carbon composites show little degradation with cycling and are accepted as having good fatigue strength. This explanation has been verified recently on oriented *rope* CNT-reinforced epoxy composites which have high modulus [6].

Other studies on the effect of CNTs on the fracture of the matrix polymer have shown that small additions of CNTs (0.1wt%-0.2wt %) resulted in a 40% increase in the fracture toughness of the polymer [7]. Microscopy studies show a very high density of nano-scale cracks in the matrix that are attributed to the improvement in the fracture toughness of the matrix polymer.In this work, the effect of carbon nanotubes on the life of structural composites subjected to static and cyclic loading is studied and a mechanism for the observed behavior is proposed. Damage mechanisms in conventional composite laminates consist of the formation of micro-cracks in the matrix that initiate and propagate under cyclic loading, eventually causing fiber failure and fracture of the composite.

The addition of CNTs can be expected to decrease the scale of damage mechanisms by several orders of magnitude resulting in an increase in the absorption of strain energy through the creation of a multitude of fine nano-scale cracks. In addition, fiber bridging at the nanoscale increases energy absorption through the participation of nanotubes in the fracture process. This effect should increase the damage tolerance of the composite and make it more resistant to damage growth under cyclic loading. An energy-based model is proposed that attempts to describe the fatigue behavior of CNT / glass-fiber hybrid composites.We have incorporated thermosetting (epoxy) polymers containing uniformly distributed nanofibers (CNTs) into conventional glass fiber polymer composites. Our recent studies have established that these resins exhibit a relatively uniform distribution of the nanofibers in the polymer with little agglomeration and clumping[8]. Hybrid composite systems that contain CNTs, both under static and cyclic loading, examined through scanning electron microscopy of the corresponding fracture surfaces exhibit failure modes that suggest the failure mechanism that is proposed here.

II. EXPERIMENTAL ANALYSIS

II.I. Materials: The epoxy resin and hardener used was EPON 826 and Epikure 3234, respectively, both manufactured by Hexion Specialty Chemicals, Inc.(Houston, Texas, USA). The EPON 826 resin was blended with 1wt% of multi-walled carbon nanotubes by Nanoledge (Clapiers, France). The current CNT loading level of 1wt% was selected for its promise to be large enough to change the mechanical behavior of the composites [7, 9] and at the same time not reduce manufacturability due to an increase in polymer viscosity .The woven glass fiber was obtained from Hexcel (Fullerton, CA USA) designated Type 7500, a 0.28 mm thick plain weave fabric.

II.II.Specimen processing: Both the CNT and non-CNT [0/90] fiber reinforced composites were manufactured by wet lay-up, cured in a heated platen press held at 80 °C and 580 kPa for one hour, with a fiber volume fraction of 0.56. Aligned 24 X 200 mm tensile specimens were cut from the cured sheets. A 6.4 mm diameter center hole was drilled in each specimen to localize damage. Aluminum tabs were bonded to the ends of the specimens to facilitate gripping. The specimens were aged for 10 d at 25 C before testing.

II.III.Test methods: Specimens were tested to failure using an MTS (Eden Prairie, Minnesota, USA) 100 kN servo-hydraulic testing machine retrofitted with a variable flow hydraulic supply digitally controlled by an Instron (Norwood, MA USA) Labtronic 8400 controller. National Instruments (Austin, TX USA) Lab VIEW v7 was used to command the controller and perform data acquisition. Prior to fatigue testing, the monotonic tensile strengths of both CNT and non-CNT composite samples were obtained.Both materials were tested in tension-tension fatigue at peak stresses of 70, 60, 45 and 30 percent of their monotonic strengths, all at a stress ratio (R) of 0.15. The loading frequency used was 3 Hz to eliminate sample heating. Representative failed specimens were chosen and their fracture surfaces were excised and sputter-coated with a 2.5 nm layer of platinum using a Bal-Tec (Blazers, Liechtenstein) Med 020 coater. The samples were imaged using a Hitachi (Tokyo, Japan) S-5000 cold field emission SEM with an accelerating voltage of 10 kV.

III. RESULTS AND DISCUSSION

III.I. Tension testing: Fig.1 shows the stress-strain responses from monotonic tensile tests conducted on the neat resin with and without CNTs. No significant effect on the elastic modulus was observed. The maximum values of strain to failure, however, were somewhat higher in the CNT-containing resin samples with corresponding slightly lower ultimate tensile strengths when compared with the unmodified resin. These changes in mechanical behavior result in an increased toughness, or energy to fracture, for the neat resin containing CNTs. Figs.2 and 3 show scanning electron micrographs (SEMs) of the fracture surfaces of the two materials. The CNT-containing resin shows a somewhat rougher fracture surface, which is in line with the increase in the fracture energy discussed above.

Fig.4 shows the monotonic tensile fracture surface in the neat resin containing CNTs. While there is generally uniform distribution of the CNTs in the resin, a few randomly distributed clumps of nanotubes (see insert in Fig.4) were also observed indicating that some agglomeration was present. These agglomerated regions are thought to be detrimental to strength as well as fatigue life .Fig.5 shows the fracture surface of a hybrid CNT composite showing pull-out of the nanotubes from the matrix (small holes and larger protruding tubes in the figure). Smaller protruding sections of nanotubes seen in this micrograph may indicate that nanotubes were also fractured with the matrix. A single hole (white arrow) corresponds to a tube that was pulled out from this surface. It is this process of nanotube pullout and nanotube fracture that is believed to contribute to the increased fracture resistance as well as significantly improved fatigue life (see below) in the hybrid CNT composites.

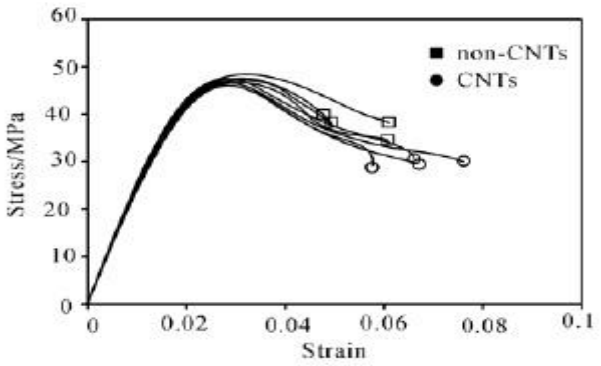

Fig.1 Tensile stress-strain responses of neat resin with and without 1wt% of CNTs

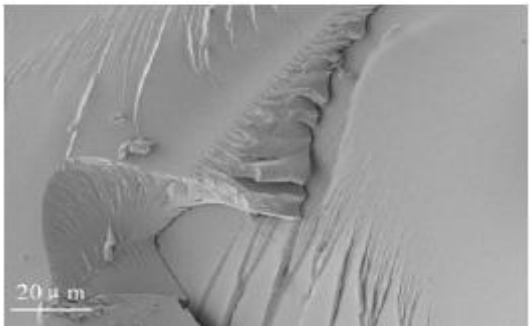

Fig.2 Fracture surface of neat epoxy matrix

III.II. Fatigue life: Fatigue life data for glass fiber-epoxy composites (three samples per point) with and without the addition of 1wt% of carbon nanotubes are shown in Fig.6. A significant increase in the number of load cycles to failure for each loading case was observed for the samples that contained the CNTs. The observed increase in life occurs at lifetimes greater than about 104 cycles. In this high cycle regime, much of the load cycles are employed for the nucleation and growth of micro cracks [1,2]. Table 1 compares the fatigue lifetimes for glass fiber composites with and without carbon nanotubes (CNTs). The improvement in fatigue life with the addition of CNTs increases as the applied cyclic stress is reduced, making the effect most pronounced at high cycles. At a cyclic stress of 44 Mpa, the addition of 1wt% of CNTs results in almost a 3 times improvement in the fatigue life.

Fig.3 Fracture surface of the CNT-modified epoxy matrix

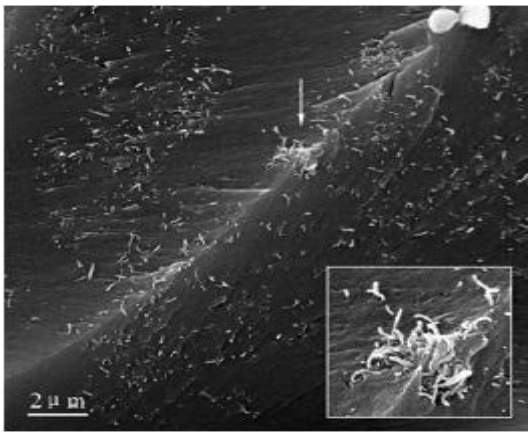

Fig.4 SEM image showing CNT distribution and an agglomerated region containing entangled carbon nanotubes

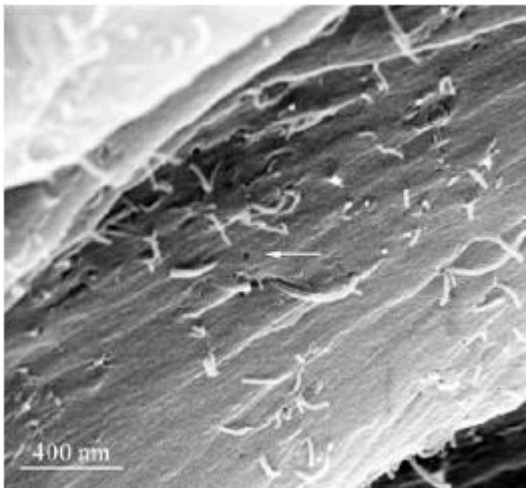

Fig.5 SEM image of fracture surface of glass fiber composite containing carbon nanotubes showing fractured and pulled-out CNTs; the arrow points at a hole from which a nanotube was pulled out

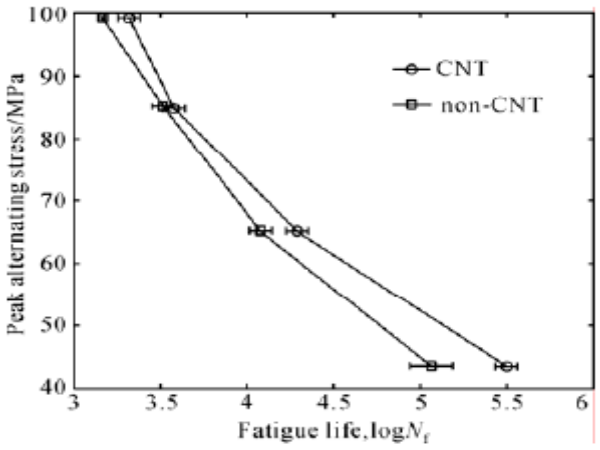

Fig.6 Applied cyclic stress versus the number of cycles to failure of glass fiber-epoxy laminates with and without the addition of 1wt% of carbon nanotubes

In the composites containing nanotubes, it is believed their presence results in a very large number of nucleating sites for cracks to be initiated and grow. Furthermore, it is believed for a given level of strain energy, a large density of nanoscale cracks will grow more slowly than the lower density of micro cracks present in composites not containing CNTs.

The result is an increase in the number of cycles required for growth and coalescence which means that high-cycle fatigue life is enhanced. In addition, nanoscale crack bridging by nanotubes will result in participation of the nanofibers in the fracture process thereby increasing the fracture energy required for crack propagation, further delaying failure.

III.III. Fracture surface analysis: High resolution scanning electron micrographs of the fracture surface of a glass fiber composite sample containing CNTs are shown in Fig.7. Both micrographs are from the same location; the micrograph on the right shows the scale of the carbon nanotubes relative to the fractured glass fiber on the left. Pull-out and fracture of carbon nanotubes were observed in the hybrid composite similar to the mechanisms observed in the neat resin/CNTs fracture surface (Fig.5). Additionally, Fig.7 demonstrates the ability of the CNTs to penetrate between glass fibers, further validating the proper dispersion of CNTs in the polymer [12].

III.IV.Differential energy model: A study of the electron micrographs of the fracture surfaces indicates that the primary difference in the fracture behavior of the traditional glass-fiber composites and the behavior of the CNT/glass-fiber hybrid composites from a mechanistic standpoint is the existence of broken and pulled-out nanotubes at the fracture surfaces within the hybrid epoxy matrix. It is proposed that these nano-scale processes in the hybrid composites results in an absorption and dissipation of strain energy which retards the growth of matrix micro cracks thereby extending the fatigue life.

Table 1 Comparison of fatigue lifetimes for glass fiber composites with and without carbon nanotubes (CNTs)

Cyclic stress amplitude/MPa	Fatigue life of glass fiber composites/cycles	Fatigue life of glass composites with the addition of carbon nanotubes/cycles	Improvement factor in life
98.0	1473	2091	1.4
85.0	3238	3813	1.2
65.0	11488	18517	1.6
44.0	109055	316227	2.9

*The improvement in fatigue life with the addition of CNTs increases as the applied cyclic stress is reduced, making the effect most pronounced at high cycles. At a cyclic stress of 44 MPa, the addition of 1wt% of CNTs results in almost a 3 times improvement in the fatigue life

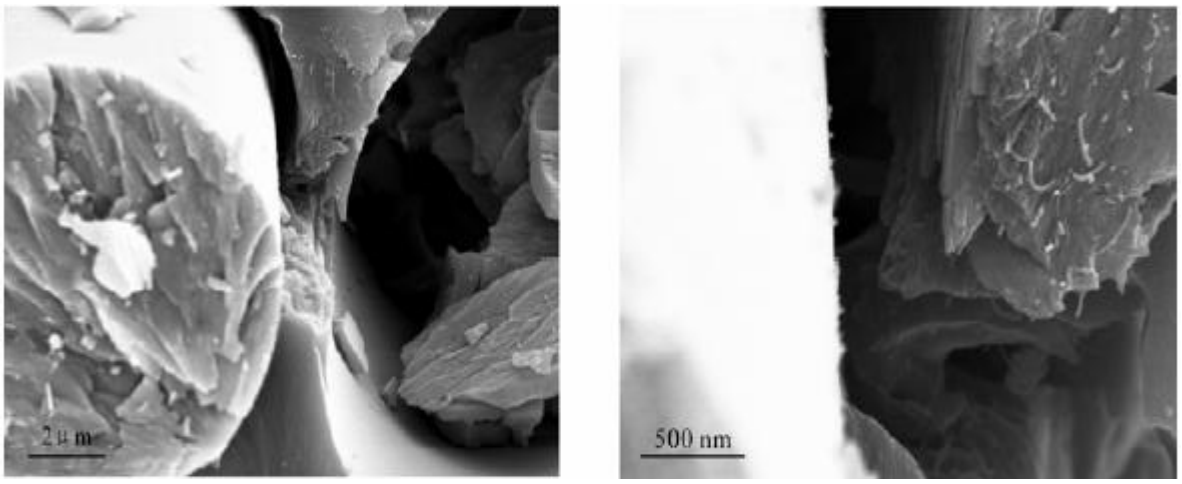

Fig.7 Fatigue fracture surface of glass fiber composite laminate containing 1wt% of carbon nanotubes in the matrix.
The higher magnification micrograph on the right shows the carbon nanotubes in the matrix surrounding the fractured glass fiber shown at lower magnification on the left

In the proposed model, individual CNTs are assumed to be evenly distributed and randomly oriented in three dimensions within the epoxy matrix. This assumption facilitates the establishment of the micrometer-scale statistical representative volume element. The bond between the nanotubes and the surrounding epoxy matrix is assumed to consist exclusively of van der Waals forces [13-15]. Due to the lower transverse coefficient of thermal expansion (CTE) in the CNTs relative to the polymer matrix[16], the CTE mismatch following curing at an elevated temperature results in a compressive radial pre-stress on the nanotubes at room temperature.

This gives rise to a frictional shear stress, □p that resists nanotube pull-out. It is also believed that a certain degree of interlocking between the CNTs and the matrix may contribute to □p [11]. Nanotubes are presumed to pull-out from the matrix unless they cross the fracture plane at a critical angle, φ that causes the tubes to fracture instead of pull out. The angle at which the behavior transitions from pull-out to fracture, φc, is presumed to be related to the rate at which the two halves of the fracture surface are separated under cycling. This concept is presented in Fig.8.

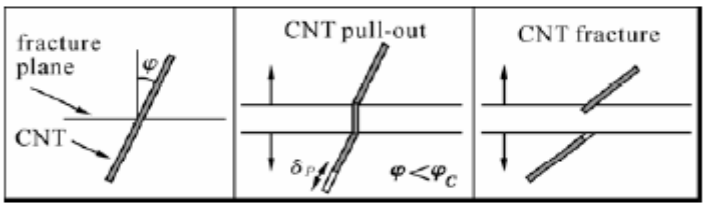

Fig.8 Observed behavior of individual CNTs at the fracture surface

III.V. Matrix fracture energy relation: General relations describing the potential energy losses in the elastic matrix of a composite are developed for both the traditional composite and the CNT hybrid composite following the methods used for fracture in reinforced ceramics by Budiansky, *et al*[17]. In the case of the traditional composite, these losses are due to the creation of matrix cracks. Similarly, in the hybrid composite, these losses go toward the creation of matrix cracks, frictional sliding at The CNT/matrix interface during CNT pulls-out, and fracture of CNTs. The development of the energy relations for the two cases proceeds in parallel until the inclusion of the terms corresponding to the frictional sliding and fracture of CNTs. Throughout the derivation, symbols corresponding to the traditional composite case will be natural (*X*, *Y*), whereas those corresponding to the hybrid composite case will be accented (X˜, Ỹ). Fig.9 presents the three states of interest in both cases.State (0) corresponds to a free body of volume V and surface ST, not subjected to any external loads, and exhibiting no displacements or strains, containing some internal stress distribution σ0. State (1) corresponds to the same body, with applied tractions *T*, which result in a stress distribution σ1, displacements *u*1, and corresponding strains ε1. With no change in the surface tractions *T*, state (2) has undergone some internal cracking resulting in crack surface SC, and new values of stress distribution σ2, displacements *u*2, and strains ε2. Similarly, for the case of the hybrid composite matrix, state (õ) corresponds to a free body of volume □ and surface □T, not subjected to any external loads, exhibiting no displacements or strains, containing some internal stress distribution $\tilde{\sigma}_0$. State (Ĩ) corresponds to the same body , with applied tractions T̃ , which result in a stress distribution $\tilde{\sigma}_1$, displacements ũ$_1$, and corresponding strains $\tilde{\varepsilon}_1$. With no change in the surface tractions T̃, state (2̃) has undergone some internal cracking resulting in new crack surface S̃C, frictional sliding due to pull-out at the new CNT / matrix interfacial surface S̃P, fracture of CNTs creating new CNT surface S̃F, and new values of stress distribution $\tilde{\sigma}$2, displacements ũ2, and strains $\tilde{\varepsilon}$2.

The constitutive relations relating stress to strain in the two cases are

$$\varepsilon = M\,(\sigma - \sigma 0) \qquad (1)$$

For the traditional glass-fiber composite and:

$$\tilde{\varepsilon} = \tilde{M}\,(\tilde{\sigma} - \tilde{\sigma} 0) \qquad (2)$$

For the CNT/glass-fiber hybrid composite, where *M* and M̃ are the elastic compliances for the two cases For the case of the traditional composite, the potential energy in each of the three states respectively can be described as in [17] by:

$$\Pi 0 = 1/2\int v\sigma 0 : M\,(\sigma 0)\,D \quad (3)$$

$$\Pi 1 = 1/2\int v\sigma 1 : M\,(\sigma 1)\,dV - \int STT \cdot u1\,dV \quad (4)$$

$$\Pi 2 = 1/2\int v\sigma 2 : M\,(\sigma 2)\,dV - \int STT \cdot u2\,dV \quad (5)$$

Where, the volume integral describes the stored elastic energy and the surface integral describes the work done at the surface of the body by the applied tractions. Taking the compliance to be a constant,

$$1 : M\,(\sigma 2) = \sigma 2 : M\,(\sigma 1)$$

The change in potential energy of the body due to the internal cracking is found to be:

$$\Pi 1 - \pi 2 = 1/2\int v\,(\sigma 1 + \sigma 2) : M\,(\sigma 1 - \sigma 2)\,dV - \int ST\,T \cdot (u1 - u2)\,ds \qquad (6)$$

Equating the external virtual work of the traction *T* over the displacement *u*1 − *u*2 to the internal virtual work corresponding to the internal stress, σ2 over the strain *M* (σ1 − σ2), we have

$$\int STT \cdot (u1 - u2)\,dS = \int v\sigma 2 : M\,(\sigma 1 - \sigma 2)\,dV \qquad (7)$$

Combining Eqs. (1), (6) and (7) gives us the general form for potential energy loss due to matrix cracking, from state (1) to state (2):

$$\pi 1 - \pi 2 = 1/2 \int_V (\sigma 1 - \sigma 2) : (\varepsilon 1 - \varepsilon 2)\, dV \qquad (8)$$

Derivation of the potential energy loss in the case of an elastic body containing frictional sliding and fiber breakage, in our case due to nanotube pull-out and the fracture of CNTs, proceeds much the same as before, up until the calculation of the virtual work. For completeness, the potential energy equation for the second case takes the exact form as its predecessor, Eq. (6), but with accented rather than natural notation:The difference in the derivation of the energy relations in the hybrid matrix case is the two additional internal virtual work terms corresponding to the frictional sliding and fiber breakage

IV. CONCLUSIONS

The addition of 1wt% of CNTs to the polymer matrix of glass fiber-epoxy composite laminates improved their high-cycle fatigue lifetimes significantly. Tensile tests on neat resin (without glass fibers) specimens showed no effect on the elastic modulus when CNTs were added. However, there was a slight increase in the strain to failure and corresponding higher toughness relative to the unmodified resin. High resolution scanning electron microscopy of the neat resin specimens after tensile fracture revealed somewhat higher surface roughness in the CNT-modified resin. Inspection of the composite specimens tested in fatigue showed carbon nanotubes that were either pulled out of the resin matrix or fractured, suggesting energy-absorbing mechanisms that may be responsible for the increase in the fatigue life observed. These include the creation of a much larger density of nucleation sites for fatigue crack initiation in the epoxy matrix as well as possible crack bridging by the carbon nanotubes. Both mechanisms can result in a significant increase in crack energy absorption during fatigue crack initiation, coalescence and propagation, resulting in the observed increase in the fatigue life when carbon nanotubes are added.

The energy based model presented here takes advantage of the even distribution and random orientation of the large numbers of CNTs in the polymer matrix and uses this as a basis for establishing a micrometer-scale representative volume element with homogenized material properties that reflect the mechanistic behavior of the entire population of CNTs it contains. Energy relations are developed for this homogenized CNT / epoxy system in parallel with the neat epoxy matrix in order to establish the energetic differences, or differential energy, in the formation and propagation of cracks within their bodies.This study shows that the addition of small fractions of carbon nanotubes to glass fiber composites can result in a significant increase in their fatigue life, making glass fiber composites more useful in applications involving high-cycle fatigue.

REFERENCES

[1] Dharan CKH. *Fatigue* Failure Mechanisms in a Unidirectionally Reinforced Composite Material [M]. *ASTM Spec. Tech. Publ*., 1975, 569: 171

[2] Dharan CKH. Fatigue Failure in Graphite Fibre and Glass Fabre- polymer Composites [J]. *J. Mater. Sci.*, 1975, 10: 1 655

[3] Hahn HT, Kim RY. Fatigue Behavior of Composite Laminate [J]. *J. Compos. Mater*, 1976, 10: 156

[4] Degrieck J, Van Paepegem W. Fatigue Damage Modeling of Fiber-reinforced Composite Materials: Review [J]. *Appl. Mech. Rev*., 2001, 54(4): 279

[5] Saghizadeh H, Dharan CKH. Delamination Fracture Toughness of Graphite and Aramid-epoxy Composites [J*]. J. Eng. Mater. Tech.: Trans. ASME, 1986, 108(4): 290*

[6] Ren Y, Lil F, Cheng HM, *et al*. Fatigue Behaviour of Unidirectional Single-walled Carbon Nanotube Reinforced Epoxy Composite under Tensile Load[J*]. Adv. Compos. Lett., 2003, 12(1): 19*

[7] Ganguli S, Aglan H. Effect of Loading and Surface Modification of MWCNTs on the Fracture Behavior of Epoxy Nan composites [J*]. J. Reinforc. Plast. Compos. 2006, 25(2): 175*

[8] Grimmer CS, Dharan CKH. High-cycle Fatigue of Hybrid Carbon Nanotube/Glass Fiber/Polymer Composites [J*]. J. Mater. Sci., 2008, 43: 4487*

[9] Gojny FH, Wichmann MHG, Fiedler B, *et al*. Influence of Nano-modification on the Mechanical and Electrical Properties of Conventional Fibre-reinforced Composites [J]. *Compos. A*, 2005, 36: 1525

[10] Kim JA, Seong DG, Kang TJ, *et al.* Effects of Surface Modification on Rheological and Mechanical Properties of CNT/Epoxy Composites [J]. *Carbon*, 2006, 44: 1898

[11] Wong M, Paramsothy M, Xu XJ, *et al*. Physical Interactions at Carbon Nanotube-polymer Interface[J]. *Polym.*, 2003, 44(25): 7757

[12] Fan Z, Hsiao KT, Advani SG. Experimental Investigation of Dispersion during Flow of Multi-walled Carbon Nanotube/ Polymer Suspension in Fibrous Porous Media [J]. Carbon, 2004, 42: 871

[13] Schadler LS, Giannaris SC, Ajayan PM. Load Transfer in Carbon Nanotube Epoxy Composites [J]. *Appl. Phys. Lett.*, 1998, 73: 3842

A Firm Retrieval of Software Reusable Component Based On Component Classification

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Abstract

The reuse system presented here is based on the principles of Attribute value classification and Threshold value. It allows a software designer to define the component, and retrieve the components which are similar to the required one. Algorithms to compute these reuse candidates are described. Once the reuse candidates for the required operations have been selected, the reuse system computes a list of packages for the set of operations. Linear-Search Algorithms for determining the package reuse list are also presented. If the suggested packages don't satisfy the requirements, the user may try slightly different operation descriptions to find other candidates. This approach facilitates the user to browse among similar components in order to identify the best candidates for reuse. The proposed classification system takes advantage of the positive sides of each classification scheme, whilst hopefully rendering the negative sides redundant. This classification scheme uses the attribute value for different parts of a component. The attribute value scheme is initially used within the classification for specifying the vendor, platform, operating system and development language relating to the component. This allows the search space to be restricted to specific libraries according to the selected attribute values.

KEYWORDS: *Reuse, Software components, classification, search, insert, attributes.*

I. INTRODUCTION

Software is rarely built completely from scratch. To a great extent, existing software documents (source code, design documents, etc.) are copied and adapted to fit new requirements. Yet we are far from the goal of making reuse the standard approach to software development.Software reuse is the process of creating software systems from existing software rather than building them from scratch. Software reuse is still an emerging discipline. It appears in many different forms from ad-hoc reuse to systematic reuse, and from white-box reuse to black-box reuse. Many different products for reuse range from ideas and algorithms to any documents that are created during the software life cycle. Source code is most commonly reused; thus many people misconceive software reuse as the reuse of source code alone. Recently source code and design reuse have become popular with (object-oriented) class libraries, application frameworks, and design patterns.

Systematic software reuse and the reuse of components influence almost the whole software engineering process (independent of what a component is). Software process models were developed to provide guidance in the creation of high-quality software systems by teams at predictable costs. The original models were based on the (mis)conception that systems are built from scratch according to stable requirements. Software process models have been adapted since based on experience, and several changes and improvements have been suggested since the classic waterfall model. With increasing reuse of software, new models for software engineering are emerging. New models are based on systematic reuse of well-defined components that have been developed in various projects.

Component: Component is a software element that conforms to a component model and can be independently deployed and composed without modification according to a composition standard. Example: General examples of concrete components include interface, computational, memory, manager, controller components and Web services. Components may come from many domains, in many languages and design notations. Also versions of components may also exist. Due to this large number of components, we think that a component management system is needed in order to keep track of the properties of all the components which are available. To incorporate reusable components into systems, programmers must be able to find and understand them. If this process fails, then reuse cannot happen. Thus, how to index and represent these components so that they can be found and understood are two important issues in creating a reuse tool.

Classifying software allows users to organize collections of components into structures that they can search easily.There have been many attempts to classify reusable components using various techniques. Normally, each of these methods has been implemented discretely. Each of the four main methods described (free text, attribute value, enumerated and faceted classification) has advantages and disadvantages associated with them. The proposed classification system takes advantage of the positive sides of each classification scheme, whilst hopefully rendering the negative sides redundant. This classification scheme uses the attribute value for different parts of a component. The attribute value scheme is initially used within the classification for specifying the vendor, platform, operating system and development language relating to the component.

This allows the search space to be restricted to specific libraries according to the selected attribute values. Additionally, this method will allow the searches to be either as generic or domain specific as required. The functionality of the component is then classified using a faceted scheme. In addition to the functional facets is a facet for the version of the component. The version of a component is directly linked to its functionality as a whole, i.e. what it does, what it acts upon, and what type of medium it operates within. The system also stores the descriptions of each component uploaded in the repository. So the system can also support keyword based search. If system stores most of the component's properties the system can serve better and can be used in different ways. Systematic software reuse is seen as a solution to address the need for short development time without compromising efficiency. Research is ongoing to develop more user-friendly and effective reuse systems. A considerable number of tools and mechanisms for supporting reuse activities in software development have been proposed.
Software Reuse:

Definition1: "Reusability is a measure of the ease with which one can use those previous concepts or objects in the new situations".
Definition2: "Reuse is the use of previously acquired concepts or objects in a new situation, it involves encoding development information at different levels of abstraction, storing this representation for future reference, matching of new and old situations, duplication of already developed objects and actions, and their adaptation to suit new requirements".
Software components provide a vehicle for planned and systematic reuse. The software community does not yet agree on what a software component is exactly. Nowadays, the term component is used as a synonym for object most of the time, but it also stands for module or function. Recently the term component-based or component-oriented software development has become popular. In this context components are defined as objects plus some-thing. What something is exactly, or has to be for effective software development, remains yet to be seen. However, systems and models are emerging to support that notion.

II. EXISTING SYSTEM

Component Classification: The generic term for a passive reusable software item is a component. Components can consist of, but are not restricted to ideas, designs, source code, linkable libraries and testing strategies. The developer needs to specify what components or type of components they require. These components then need to be retrieved from a library, assessed as to their suitability, and modified if required. Once the developer is satisfied that they have retrieved a suitable component, it can then be added to the current project under development. The aim of a 'good' component retrieval system is to be able to locate either the exact component required, or the closest match, in the shortest amount of time, using a suitable query. The retrieved component(s) should then be available for examination and possible selection.Classification is the process of assigning a class to a part of interest. The classification of components is more complicated than, say, classifying books in a library. A book library cataloguing system will typically use structured data for its classification system (e.g. the Dewey Decimal number). Current attempts to classify software components fall into the following categories: free text, enumerated, attribute-value, and faceted. The suitability of each of the methods is assessed as to how well they perform against the previously described criteria for a 'good' retrieval system, including how well they manage 'best effort retrieval'.Component Classification Schemes: There are four classification techniques.

2.1 Free Text Classification

Free text retrieval performs searches using the text contained within documents. The retrieval system is typically based upon a keyword search. All of the document indexes are searched to try to find an appropriate entry for the required keyword. The major drawback with this method is the ambiguous nature of the keywords used. Another disadvantage is that a search my result in many irrelevant components. A typical example of free text retrieval is the 'grep' utility used by the UNIX manual system. This type of classification generates large overheads in the time taken to index the material, and the time taken to make a query.

All the relevant text (usually file headers) in each of the documents relating to the components are index, which must then be searched from beginning to end when a query is made.

2.2 Enumerated Classification

Enumerated classification uses a set of mutually exclusive classes, which are all within a hierarchy of a single dimension. A prime illustration of this is the Dewey Decimal system used to classify books in a library. Each subject area, for example, Biology, Chemistry etc, has its own classifying code. As a sub code of this is a specialist subject area within the main subject. These codes can again be sub coded by author. This classification method has advantages and disadvantages pivoted around the concepts of a unique classification for each item. The classification scheme will allow a user to find more than one item that is classified within the same section/subsection assuming that if more than one exists. For example, there may be more than one book concerning a given subject, each written by a different author.

This type of classification schemes is one dimensional, and will not allow flexible classification of components into more than one place. As such, enumerated classification by itself does not provide a good classification scheme for reusable software components.

2.3 Attribute value

The attribute value classification scheme uses a set of attributes to classify a component [6]. For example, a book has many attributes such as the author, the publisher, a unique ISBN number and classification code in the Dewey Decimal system. These are only example of the possible attributes. Depending upon who wants information about a book, the attributes could be concerned with the number of pages, the size of the paper used, the type of print face, the publishing date, etc. Clearly, the attributes relating to a book can be:

1. Multidimensional. The book can be classified in different places using different attributes.
2. Bulky. All possible variations of attributes could run into many tens, which may not be known at the time of classification.

Each attribute has the same weighting as the rest, the implications being that it is very difficult to determine how close a retrieved component is to the intended requirements, without visually inspecting the contents.

2.4 Faceted Classification

Faceted classification schemes are attracting the most attention within the software reuse community. Like the attribute classification method, various facets classify components; however, there are usually a lot fewer facets than there are potential attributes (at most, 7). Ruben Prieto-Diaz has proposed a faceted scheme that uses six facets. He proposed three functional and three environmental facets.

1. The Functional Facets are: Function, Objects, and Medium.
2. The Environmental Facets are: System type, Functional area, setting.

Each of the facets has to have values assigned at the time the component is classified. The individual components can then be uniquely identified by a tuple.

For example: <add, arrays, buffer, database manager, billing, book store>

Clearly, it can be seen that each facet is ordered within the system. The facets furthest to the left of the tuple have the highest significance, whilst those to the right have a lower significance to the intended component. When a query is made for a suitable component, the query will consist of a tuple similar to the classification one, although certain fields may be omitted if desired.

For example: <add, arrays, buffer, database manager, *, *>

The most appropriate component can be selected from those returned since the more of the facets from the left that match the original query, the better the match will be.

Frakes and Pole conducted an investigation as to the most favourable of the above classification methods. The investigation found no statistical evidence of any differences between the four different classification schemes; however, the following about each classification method was noted:

- Enumerated classification: Fastest method, difficult to expand.
- Faceted classification: Easily expandable, most flexible.
- Free text classification: Ambiguous, indexing costs.

Attribute value classification: Slowest method, no ordering.

3. Proposed System

There have been many attempts to classify reusable components using various techniques. Normally, each of these methods has been implemented discretely. Each of the four main methods described (free text, attribute value, enumerated and faceted classification) has advantages and disadvantages associated with them. The proposed classification system takes advantage of the positive sides of each classification scheme, whilst

hopefully rendering the negative sides redundant. This classification scheme uses the attribute value for different parts of a component. The attribute value scheme is initially used within the classification for specifying the vendor, platform, operating system and development language relating to the component.
This allows the search space to be restricted to specific libraries according to the selected attribute values. Additionally, this method will allow the searches to be either as generic or domain specific as required.
The next step is retrieval of component based on the component name and the threshold value. The technique used here is linear search algorithm. First it retrieve based on component name from repository and then find the distance and compare it with the threshold value. If the distance value is less than the threshold value add the component to the final out put list and display them as the output. Here we have download option by click on it you can download that component.

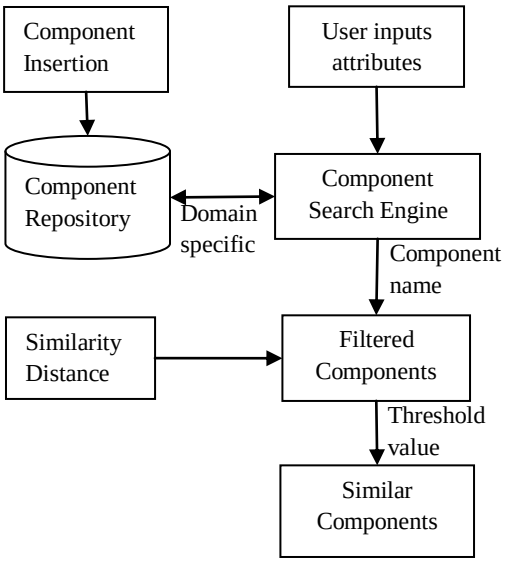

Fig. 1 Proposed System

3.1 Component Classification
The generic term for a passive reusable software item is a component. Components can consist of, but are not restricted to ideas, designs, source code, linkable libraries and testing strategies. The developer needs to specify what components or type of components they require.
These components then need to be retrieved from a library, assessed as to their suitability, and modified if required. Once the developer is satisfied that they have retrieved a suitable component, it can then be added to the current project under development. The aim of a 'good' component retrieval system is to be able to locate either the exact component required, or the closest match, in the shortest amount of time, using a suitable query. The retrieved component(s) should then be available for examination and possible selection.
An integrated classification scheme, which employs a combination of one or more classification techniques, is proposed and likely to enhance the classification efficiency. The proposal is described in the following sub section. This had given rise to development of a software tool to classify a software component and build reuse repository.
Integrated classification scheme which combines the attribute value and faceted classification schemes to classify components with the following attributes.

1. Operating system
2. Language
3. Keywords
4. Inputs
5. Outputs
6. Domain
7. Version
8. Category

The attributes when used in query can narrow down the search space to be used while retrieval.
The proposed software tool will provide an user friendly interface for browsing, retrieving and inserting components. Two algorithms are proposed for searching and inserting components as part of this software tool.

3.2 Algorithm 1: Component Insert (Component facet and attributes)
Purpose: This algorithm inserts a component into the reuse repository with integrated classification

scheme attributes.
Input: Component facet and attributes
Output: Component insertion is success or failure.
Variables: rrp: reuse repository array,
rp: repository pointer,
flag : boolean

```
if((rrp[i].lang<>lan) and rrp[i].fun>fun) and (rrp[i].dom<>dom) and (rrp[i].os<>os) and (rrp[i].ip<>ip) and (rrp[i].op<>op) and (rrp[i].ver<>ver))
    i++;
else
    flag = true;
    break;
if (flag)
    rrp[rp].lang = lan;
    rrp[rp].fun = fun;
    rrp[rp].os = os;
    rrp[rp].dom = dom;
    rrp[rp].ip = ip;
    rrp[rp].op = op;
    rrp[rp].ver = ver;
    return successful insertion;
else
    component is already exists;
```

The insert algorithm stores the newly designed or adapted existing component into the reuse repository. When component attributes are compared with existing repository component attributes and determines no similar components are found then component is inserted successfully otherwise component not inserted in repository and exits giving message that component already exists.

3.3 Algorithm 2: Search Component (Component facet and attributes)
Purpose: This algorithm searches for relevant components with given component facet and attributes from reuse repository.
Input: Component facet and Component attributes.
Output: list of relevant componentsPlace table titles above the tables.
Variables: rrp: reuse repository array
rp: repository pointer
table: result array
i.j : internal variables
flag: boolean

```
if (component facet <> null )
  for ( i=1; i <= rp ; i++ )
  if ((rrp[i].language = lan ) and (rrp[i].function = fun ))
    table[j].lang = rrp[j].lang
    table[j].fun = rrp[j].fun
    table[j].os = rrp[j].os
    table[j].ip = rrp[j].ip
    table[j].op = rrp[j].op
    j++;
  else
    flag = 0;
  if (component facet<>null) and (any of the other attributes<> null )
    for (i =1;i <= rp ;i++ )
      if ((rrp[i].lang = lan) and (rrp[i].fun = fun))
        if((rrp[i].os = os) or (rrp[i].ip = ip) or (rrp[i].op = op) or rrp[i].dom = dom) or (rrp[i].ver = ver))
          table[j].lang = rrp[i].lang;
          table[j].fun = rrp[i].fun;
          table[j].os = rrp[i].os;
          table[j].dom = rrp[i].dom;
          table[j].ip = rrp[i].ip;
          table[j].op = rrp[i].op;
```

```
            table[j].ver  =  rrp[i].ver;
        if(!flag )
```
No component is matched with given attributes.

4. Conclusion and Future Scope

The performance of this reuse system can be evaluated from the standpoint of user effort and maintenance effort. The user effort consists of all the effort which must be expended by the user in order to use the reuse system. It is very difficult to formally measure user effort. However, queries can be easily formulated, and therefore the user is not required to learn any formalism. The maintenance effort consists of all the effort which is necessary to keep the system working and up to date. This effort includes adding components to the knowledge base. The maintenance stage is highly facilitated in this system, as insertion of new components into the knowledge base can be done incrementally.

All the algorithms can be implemented in common lisp. The proposed reuse system can be used within an application domain like Unit, and utilize the reusable concepts of Ada. More recent object-oriented reusable designs like frameworks can also work with our system. One of the prime economic justification that for proposing this reuse system is to allow high-speed and low-cost replacement of aging systems, whose functions and data requirements have become well known.

User gets logged-in and searches for the components from the database. Then the user stores the searched components in the repository. Later on next user gets logged in and searches the component from the repository .Then the matched components are displayed on the grid view.

In addition to the retrieval of relevant component and also multimedia effect like audio output, we can still work on applying more multimedia effects like adding video output for the searched output so as to make the registered user more comfortable in selecting and downloading the searched component.

References

[1] Gowtham Gajala, "Implementation of Attribute values and Faceted value classification scheme for constructing Reuse Repository", International Journal of Computer Trends and Technology- volume4Issue1- 2013.

[2] Ruben Prieto-Diaz, "Implementing Faceted Classification for Software Reuse", Communication of the ACM, Vol. 34, No.5, May 1991.

[3] R.Prieto-Diaz and P. Freeman, "Classifying Software for Reusability", *IEEE Soflware,* Ja.niiary 1987. pp. 6-16.

[4] Boelim, B., Penedo, M.H., Stuckle, E.D., Williams, R.D. and Pyster, A.B. "A Software Development Environment for Improving Software Productivity", *IEEE Computer,* 17(6), 1984, pp. 30-42.

[5] E. J. Ostertag and J. A. Hendler, An AI-based reuse system, Tech. Rep. *(2.9-TR-2197, UMIACSTR- 89-16,* Univ. of Maryland, Dept. of Computer Science, Feb 1989, pp. 1-2G.

[6] M. Wood and I. Sommerville, "An Information Retrieval System for Software Components," SIGIR Forum, Vol. 22, No. 314, Spring/Summer 1988, pp. 11-25.

[7] N. J. Nilsson, Principles of Artificial Intelligence, Morgan Kaufmann, CA, MIT Press, 1980, pp. G8-88. [GI Thomas H. Cormen, Charles E. Leisersoii and Ronald L. Rivest, Introduction to Algorithms, MIT Press, 1990, pp. 525-530.

[8] William B. Frakes and Kyo Kang, "*Software Reuse Research: Status and Future*", IEEE Transactions on Software Engineering, VOL. 31, NO. 7, JULY 2005.

[9] Rym Mili, Ali Mili, and Roland T. Mittermeir, "*Storing and Retrieving Software Components a Refinement Based System*", IEEE Transactions of Software Engineering, 1997, Vol. 23, No. 7, pp. 445-460.

Reduced Complexity Of Service Matching Using Tree Concept For Multi-Tenants In Cloud Environment

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ABSTRACT:

Cloud computing is a highly Research area in the technical I.T field and economic world, and many of the software industry have entered the development of cloud services. It is the preeminent on-demand service system along with a Pay-as-you-go Policy. In Multi-tenant networking, with which multiple customers (tenant) networks are virtualized over a single collective physical infrastructure. Dynamic provisioning in the cloud requires an integrated solution across the technology stack (software, platform and infrastructure) combining functional, non-functional and resource allocation requirements. Research works in the area of web service matching. It reviews the available cloud computing services and identifies and clarifies their main characteristics. The Architectural features of multi-tenancy and classify them according to the requirements of end-users, enterprise that use the cloud as a platform, and tenant providers themselves. Service is matched with existing tenants and according to the requirement of end-users. Matching techniques such as string-based, chema based, semantic web service based, constraint-based, linguistic, graph-based and taxonomy-based. Clients spend extreme amounts of time and energy searching through a list of available services.

KEYWORDS: *Cloud Computing,Complexity, Multi-tenant, Service Matching, Taxonomy based Services*

I. INTRODUCTION

The Greek myths tell of creatures plucked from the surface of the Earth and enshrined as constellations in the night sky. Something similar is happening today in the world of computing. Data and programs are being swept up from desktop PCs and corporate server rooms and installed in the compute cloud. In general, there is a shift in the geography of computation what is cloud computing exactly? "An emerging computer paradigm where data and services reside in massively scalable data centers in the cloud and can be accessed from any connected devices over the internet" Cloud computing is an emerging paradigm in the computer industry where the computing is moved to a cloud of computers. It has become one of the buzz words of the industry. The core concept of cloud computing is, quite simply, that the vast computing resources that we need will reside somewhere out there in the cloud of computers and we'll connect to them and use them as and when needed.

II. THEORETICAL BACKGROUND

A multi-tenant application lets customers (tenants) share the same hardware resources, by offering them one shared application and database instance, while allowing them to configure the application to fit their needs as if it runs on a dedicated environment. The key aspects of multi-tenancy:

1. The ability of the application to share hardware resources.

2. The offering of a high degree of configurability of the software.

3. The architectural approach in which the tenants (or users) make use of a single application and database instance.

2.1. Introduction to Service Matching

System allows the client to state explicitly their functional and non-functional requirements; there are times when a client is unable to provide such information. Therefore propose a technique that helps create platform and infrastructural assignments for a new tenant. Since functionalities that match a client's requirements can come from multiple existing tenants with different specifications, platform and infrastructural matching for a new tenant can be determined by combining values for features such as operating systems, software frameworks, memory requirement from across all matched tenants.

2.2. Approach to Taxonomy Based Service Matching

There are several open issues with cloud such as security, availability, scalability, interoperability, service level agreement, data migration, data governance, trusty pyramid, user centric privacy, transparency, political and legal issues, business service management etc. In the ETE (Enterprise Requirement-Tenant Supplier- End User Requirement) Architecture, different types of services considered at user and tenant provider side. After consideration match the user requirements with Tenant functionality.

2.3. Complexity Analysis of Existing Technique

Table 1 Complexity Analysis of Existing Technique

Algorithm	Technique	Time Complexity
Brute Force Algorithm	String Matching	O(mn) where m=n=string length
Hungarian algorithm-Bipartite graph matching (Dynamic)	Graph Matching	$O(\|v\|^3)$ |V|= no. of vertices in graph
Chunk Folding	Schema Matching	Change Vary over time
Tenant selector matching using Degree of match	Taxonomy Matching	$O(n^4)$

III. PROPOSED ALGORITHM

3.1. Introduction to System

The taxonomy has a tree-based structure. At the root of the tree are all cloud services. The first level is made up of the three main service categories. The next levels correspond to the common characteristics, followed by the service specific characteristics.

The taxonomy levels are

1. Service Category-S_c
2. License Type-L_t
3. Payment System-P_s
4. Service Level Agreement-S_a
5. Standardization Effort-E_s

In the tree based structure, all levels are particular defined for a specific type. All levels are increase the performance and it is useful for service matching. Additionally, the cloud can be expanded to include a grading of importance scheme. For matching cloud computing use degree of matching.The here proposed taxonomy is capable of classifying both current and future cloud computing services. The simple tree structure allows quick comparisons, by giving the user a set of choices at each level. This clear structure makes comparing cloud computing services more efficient than using table based comparisons.

3.2. Proposed Algorithm

Tree Level Service Matching(TLSM)

The proposed algorithm is as follows.

Step 1: Get End Users Service Requirement.
Step 2: Store Requirement according to User ID.
Step 3: Get Tenant List T which is used for Cloud.
// Find Available tenant which is free
Step 4: **for** i = 1 to n do
Step 5: Check **if** Availble Tenant T_i has an PAUSED State

Then
Change in ACTIVE State.
Else
TENANT has BUSY state.
end for
Step 6: Generate List of AVAILABLE Tenant ID
Step 7: Create TREE For Both Tenant Services for a specific Tenant T_t and Users Services for Particular User ID U_t.
Step 8: TREE Create with Specific Level // Creating a Tree
for TREE Level T_L = 1 to j do
T[j] = $\{S_c, L_t, P_s, S_a, E_s\}$ // Different levels
end for
Step 9: Now Matching the Tree T_t and U_t
Step 10:Initialization: $(w_1, w_2, w_3) \leftarrow$ weight of Tenant nodes
// Tree node mapping
Step 11:**if** the roots of trees A and B contain different symbol
then
Step 12:**return** (0, A.nodes, B.nodes) // Services are not Match
Step 13:**else**
Step 14: $U_s \leftarrow$No. of subtree for User service Level of A;
Step 15: $P_s \leftarrow$No. of subtree for Provider service Level of B;
Step 16:Initialization: $a[i, 0] \leftarrow 0$ for i = 0, …, U_s;
Step 17: $b[0, j] \leftarrow 0$ for j = 0, …, P_s;
Step 18:**for** each Tenant T_i // Degree of matching
Step 19:**for** each Tree level T_L
Step 20: Match Us and Ps
Step 21: **if** pair of node ($[A_i , B_j]$= Exact)**then** $w(A_i , B_j) = w_1$
Step 22: **if** pair of node ($[A_i , B_j]$= Plug in)**then** $w(A_i , B_j) = w_2$
Step 23: **if** pair of node ($[A_i , B_j]$= Subsume)**then** $w(A_i , B_j) = w_3$
Step 24: **elseif** pair of node ($[A_i , B_j]$= fail)**then** $w(A_i , B_j) = 0$
Break;
Step 25:**end for**
Step 26:**end for**
Step 27:**for** each Tenant T_i
Step 28:$T_i = \sum_{i=1}^{n}$ (Weight of node
Step 29:Find Max-weight Tenant T_i in all tenants
Step 30:Assign a Tenant T_i to User.
Step 31:**end for**

3.3. Description of Algorithm

The TLSM algorithm which handles nested tree service matching list is given in Figure 5, where A and B are trees to be matched. It follows the formulation of Service Tree Matching(TLSM) above,

Lines 1-2 in Figure 5 Get the Users and tenants requirement. Lines 4-6 find the available tenant which are free. Lines 7-8 generate a tree according to specific level. Lines 11-12 compare the labels (tag names) of the root nodes of the two trees A and B and return 0 if they are different. Lines 14-17 initialize variables. Lines 18-26 compare the degree of matching and assign a weight to each nodesLines 27-29 sum of weight and find maximum weightage tenant.There are specific level for a tree and it is defined in Lines 8 $\{S_c, L_t, P_s, S_a, E_s\}$ which are S_c= Service Category, L_t = License type, P_s = Payment System, S_a = Service Level Agreement,E_s= Standardization Effort.

When the degree of match between a client requirement and a tenant functionality is to be calculated, their inputs and outputs are compared to identify the best match for each input and output parameters of a client requirement. Degree of match can be one of exact match, instance of (plug-in),subsumption or disjoint. Matches are ordered according to their degree of similarity,that is, exact match > plug-in > subsume > disjoint. The best match between a client requirement and a tenant functionality is determined by taking a minimum of their input and output matches.

Exact: Client's Requirement = Tenant's Functionality
Plug-in: A plug-in match is one where inputs and/or outputs of a client requirement forma supertype of the inputs and/or outputs of a tenant functionality,
Subsume: In case of a subsume match, a tenant functionality's inputs and/or outputs form a supertype of a client requirement's inputs and/or outputs.
Fail: Client's Requirement ≠ Tenant's Functionality

3.4. Complexity Analysis Of Proposed Algorithm and Results

Complexity of the TLSM (Tree Level Service Matching) Algorithm calculated with the inclusion of several tasks such as searching and matching input and output tenant functionality. Here calculating relationship between existing tenants and user functionalities and iterating through all the tenants and determine number of matching and find a excecution time which have a running time of $O(N^2)$. Thus. Complexity of the Algorithm in terms of its most time consuming task is $O(N^2)$.

Step 1: Let *N* denote the Number of Tenant which is available in the cloud. So First Check for all tenant Which is in ACTIVE state. So *N* times execute.

Step 2: Now Create a Tree with a specific level for all tenants which is above defined in TLSM Algorithm. So again it *N* times perform.

Step 3: Initiallizing the weights *w1,w2,w3* which is assign to a particular node based on the Degree of Matching which is constant. Hence, $O(1)$ time execute.

Step 4: Define array of User Level Subtree and Service Provider Level Subtree individually so both $O(1)$ time execute.

Step 5: Now Matching a functionality of User Tree with all N Tenants and which is also match with all specified tree level. So N^2 times execute.

Step 6: Find a Maximum weight of tenant from all available tenants. Hence, N times perform.

Now Calculating the Time Complexity is Simplified.

$$T(N) = N+N+1+1+1+N^2+N$$
$$= N^2 + 3N + 3$$
$$= O(N^2)$$

3.5 Comparative Analysis with Existing Techniques

Table 2 Comparative analysis with existing techniques

Algorithm	Technique	Time Complexity
Brute Force Algorithm	String Matching	O(mn) where m=n=string length
Hungarian algorithm Bipartite graph matching (Dynamic)	Graph Matching	$O(\|v\|^3)$ |V|= no. of vertices in graph
Chunk Folding	Schema Matching	Change Vary over time
Tenant selector matching using Degree of match	Taxonomy Matching	$O(n^4)$
Tree Level Service Matching in Cloud environment	Taxonomy Matching	$O(N^2)$

3.6. Conclusion And Future Work

Platform as a service (PaaS) and Software as a service (SaaS) are find the crucial issue of dynamic, service-tenant in cloud-based systems, and it containsn several key features specifically suited to cloud-based systems like integrated functional and non-functional requirement matching at SaaS, PaaS and IaaS levels;

Dynamic resource allocation using state information;and elimination of redundant tenant functionalities in order to prune the search space. And also cost and time are reduced to matching a service and dynamic resource allocation.Match making Algorithm choose an appropriate tenant according to users requirement however, it find based on the degree of match, states, constraints and behavior of tenant with tree design. Future work would involve using different tree based approach and testing inlarger case studies and real-life cloud based systems from many different domains.

REFERENCES

[1] C. N. Höfer and G. Karagiannis, "Cloud computing services: taxonomy and comparison", Journal of internet services and application, vol.2, Number 2, 2011, 81-94.

[2] Grobauer, B.walloschek, T.stocker, "Understanding cloud computing Vulnerabilities", Security and privacy IEEE, vol. 9, 2011, pp.50-57.

[3] L. Ramachandran, N. C. Narendra, K. Ponnalagu, "Dynamic provisioning in Multi-tenant Service clouds", Service Oriented Computing and Applications, Vol. 6, 2012.

[4] A. carus, H. Nusret bulus, A.mesut, "wordmatch: word based stringmatching over compressed texts", international scientific conference, Nov. 2007, vol. I, 357-360.

[5] S. Aulbach, T. Grust, D. Jacobs, A. Kemper, J. Rittinger, "Multi-tenant Databases for Software as a service: schema mapping techniques", SIGMOD'08, June 9–12, 2008.

[6] D. Skoutas, A. Sheth, "Efficient Semantic Web Service Discovery in Centralized and P2P Environments", ISWC 2008, pp. 583–598.

[7] U. Bellur, R. Kulkarni, "Improved Matchmaking Algorithm for Semantic Web Services Based on Bipartite Graph Matching", IEEE International Conference onWeb Services, 2007, pp. 86 – 93.

[8] M. Paolucci, T. Kawamura, TR. Payne, KP. Sycara(2002), "Semantic matching of web services capabilities". In: International semanticweb conference, pp 333–347.

[9] R. Mietzner, A. Metzger, F. Leymann, K. Pohl (2009), "Variability modeling to support customization and deployment of multi-tenant-aware software as a service applications". In: PESOS '09: proceedings of the 2009 ICSE workshop on Principles of engineering service oriented systems. IEEE Computer Society, Washington, DC, USA, pp 18–25.

[10] M. Hachicha; J. Darmont, "A Survey of XML Tree Patterns," Knowledge and Data Engineering, IEEE Transactions on , vol.no.99, pp.1-20, oct-2011.

[11] U. Bellur, H. Vadodaria (2008) On extending, "semantic matchmaking to include preconditions and effects". In: ICWS, pp 120–128.

[12] R.Calheiros, R.Ranjan, A. Beloglazov, César A. F. De Rose, and Rajkumar Buyya, "CloudSim: A Toolkit for Modeling and Simulation of Cloud Computing Environments and Evaluation of Resource Provisioning Algorithms", Software: Practice and Experience, Vol. 41, issue 1, 2011, pp 23-50.

Pulsed Electrodeposition of Nano-Crystalline Ni with Uniform Co-Depostion of Micron Sized Diamond Particles on Annealed Copper Substrate

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ABSTRACT

Nanocrystalline nickel was deposited on annealed copper substrate of unit surface area (1 cm^2) via pulsed electrodeposition technique using potentiostat (model 263A, Princeton Applied Research, USA) from Watts bath containing nickel sulfate, nickel chloride , boric acid and sodium citrate. Diamond particles of three different dimensions, viz., 1, 3, and 6 micron were added separately (5 g/L) to the watts bath and co-deposited along with nanocrystalline nickel. The temperature was kept constant at 55 °C. The solution was sonicated for 45-60 minutes prior to deposition to disperse the diamond particles uniformly in the bath. Depositions were carried out at different current densities, viz., 50, 100 and 200 mA/ cm^2 for different durations, i.e., 7, 14 and 21 minutes and best results are optimized for 200mA/cm^2 so it is used for all process here .Scanning electron micrographs(SEM) show uniform deposition of Microstructure of micron diamond on the surface of copper embedded in the nickel matrix. Elemental mapping confirmed uniform deposition of nickel and diamond with almost no cracks or pits. Mechanical properties such as, Vicker's hardness and wear properties were investigated using microindentation, tribology and laser profilometry. Improved microstructural and mechanical properties were found in the case of electrodeposited surfaces containing followed by 3 and 6 micron diamond. The properties were also found better than those processed via stirring the solution during deposition.

KEYWORDS: *Nanocrystalline Ni, Electrodeposition, Codeposition, Annealed copper.*

I. INTRODUCTION

In the current work, nanocrystalline Ni-Diamond films were synthesized by pulsed electrodeposition using a watts bath . Depositions were optimized on the current density range of 50-200 mA/cm^2 and 200mA/$cm^2$was best suitedto achieve a uniform equiaxed coating with a target of high Ni-Diamond content owing to their superior corrosion resistance and enhanced hardness. Nowadays, in order to fabricate nanocrystalline metallic films, many deposition techniques are available, such as sputtering, molecular beam epitaxy, vacuum evaporation, sol-gel, thermal spray, etc. But all these methods require high precision process control, which demand higher capital cost and incur huge material waste. But electrodeposition is an established and inexpensive technology among other fabricating processes which is accomplished by fabricating metallic alloys using low-temperature synthesis from aqueous solutions. This has an advantage of preparation of films over a large surface area without impairing materials purity in a relatively shorter period of time. In the electrodeposition process, the film properties mainly depend on deposition conditions, e.g, current density, deposition potential, bath type density, deposition potential, bath type density, deposition potential, bath type the electrochemical deposition conditions as well as physical parameters such as thickness, the substrate type, and orientation, it is possible to control and optimize the electrodeposited films (such as coating thickness, cluster size, etc.)

Nanosized Ni deposits require the application of much higher current densities, which normally leads to cracks in films. Pulse electro deposition provides more uniform and crack-free deposits with required properties. The pulse electrodeposited Nanocrystalline (nc) Ni-Diamond films can receive great attention due to

enhanced mechanical properties, and improved corrosion resistance when the Nanocrystalline films are dense and defect free.

1.1. PROBLEM STATEMENT REGARDING EXPERIMENT –Major obstacle regarding the experimental research was that we were unable to get a uniform co- deposition of the diamond particles on the annealed copper substrate (due to very early settling down of diamond particles owing to their higher density) during the pulsed electro deposition of nickel on the annealed Cu substrate using potentiostat and hence we cannot get effective simultaneous deposition of both Ni and diamond.

1.2. STRATEGY USED TO OVERCOME- We used a ultrasonicator during the pulsed deposition which sent ultrasonic waves into solution and woúld not allow the diamond particles to settle down and we can get an uniform coating with uniform deposition of diamond particles.

II. EXPERIMENTAL DETAILS

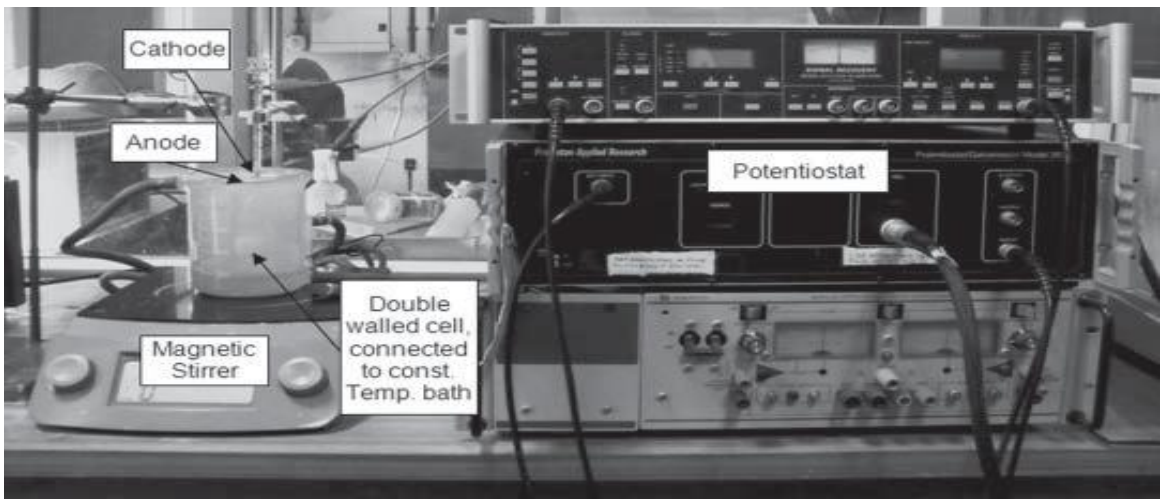
Nanocrystalline nickel was deposited on annealed copper substrate of unit surface area (1 cm^2**)** via pulsed electro deposition technique using potentiostat (model 263A, Princeton Applied Research, USA) from Watts bath containing nickel ($NiSO_4.7H_2O$)**,** nickel chloride ($NiCl_2.6H_2O$), boric acid and citrate complexing agent sodium citrate($Na_3C_6H_5O_7.2H_2O$). Diamond particles of three different dimensions, viz., 1, 3, and 6 micron were added separately (5 g/L) to the watts bath and co-deposited along with Nanocrystalline nickel. The temperature was kept constant at 55 °C. The solution was sonicated for 45-60 minutes prior to deposition to disperse the diamond particles uniformly the bath.

Electrolyte Bath Compositions Utilized for the Co-deposition of Ni-Diamond film

Composition	**Concentration**	**Parameters**
NiSO4.7H2O, g/L	- 250	
NiCl2.6H2O,g/L	- 40	Temp. = at 55 °C
H3BO3, g/L	- 40	
Sodium citrate, g/L	- 25	

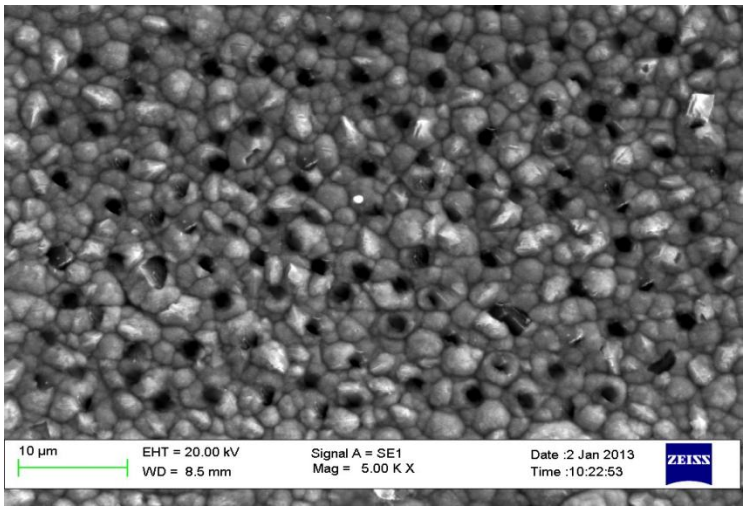
Depositions were carried out at different current densities, viz., in 50, 100 and 200 mA/ cm^2 for different durations, i.e., 7, 14 and 21 minutes. One cycle of deposition corresponds to 1 minute. Scanning electron micrographs show uniform deposition of Microstructure of micron diamond on the surface of copper embedded in the nickel matrix. Elemental mapping confirmed uniform deposition of nickel and diamond with almost no cracks or pits. The analysis of the electrodeposited surfaces were done using SEM, and micromechanical properties, such as, Vicker's hardness . Improved microstructural and mechanical properties were found in the case of electrodeposited surfaces containing 6 micron diamond followed by 3 and 1 micron diamond. The mechanical properties were also found better than those processed via stirring the solution during deposition.

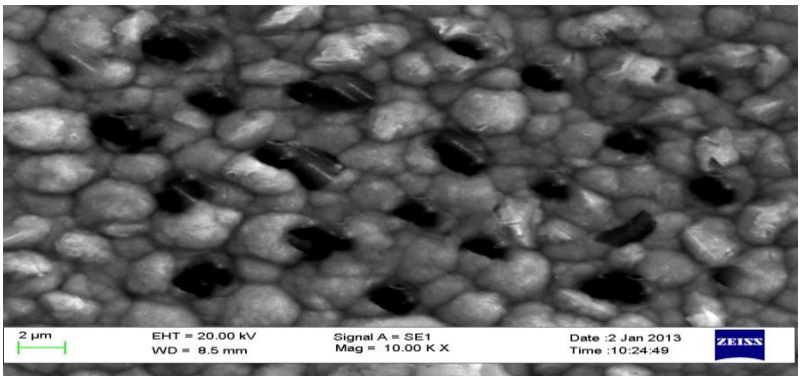
2.1. POTENTIOSTAT USED FOR PULSED ELECTRODEPOSITION :- (MODEL 263A, PRINCETON APPLIED RESEARCH, USA)

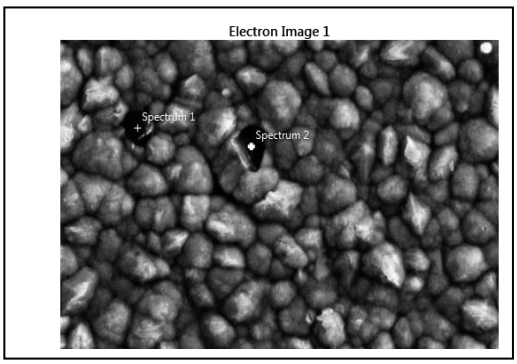


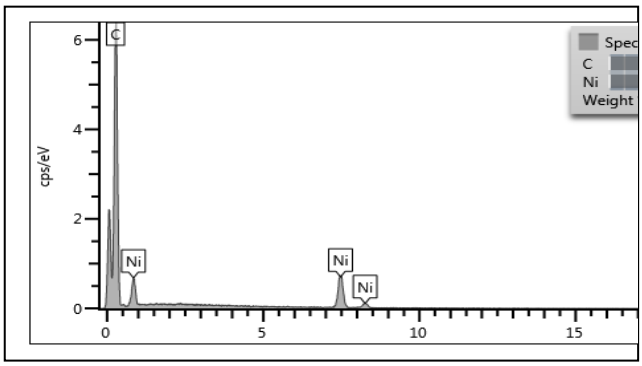
OBSERVATIONS AND RESULTS – Experimental parameter I –3 micron diamond, (5 g/L), 60 ml solution , 30 min prior to sonication , 3 min deposition + 3 min sonication , Temperature 50-55 degree Celsius
21 cycles intermittent (electrodes kept dipped while sonication intervals) no deposition while sonication

THE Images on the right hand side are the S.E.M images of the equiaxed NANOCRYSTALL-INE DEPOSITED NICKEL(with uniformly deposited 3 MICRON DIAMOND OVER IT) on the annealed Cu substrate

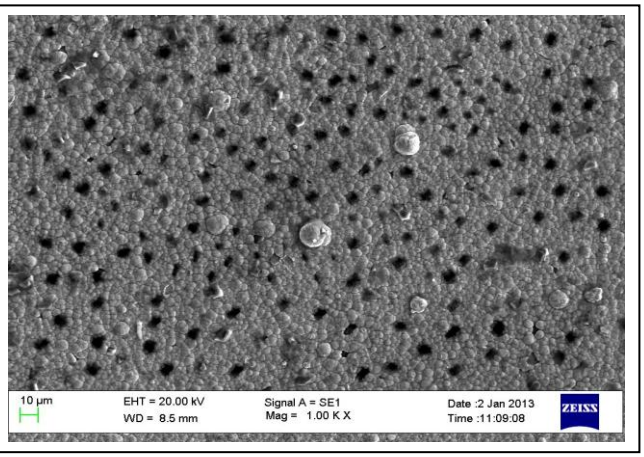


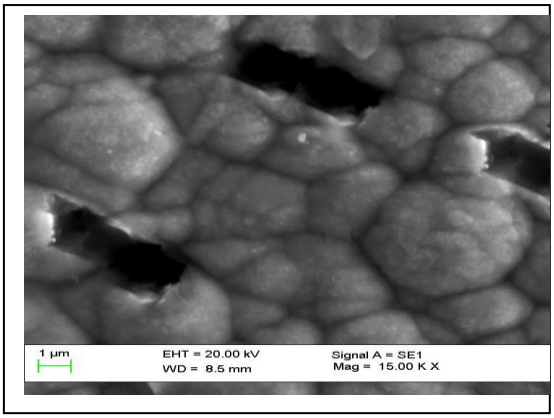






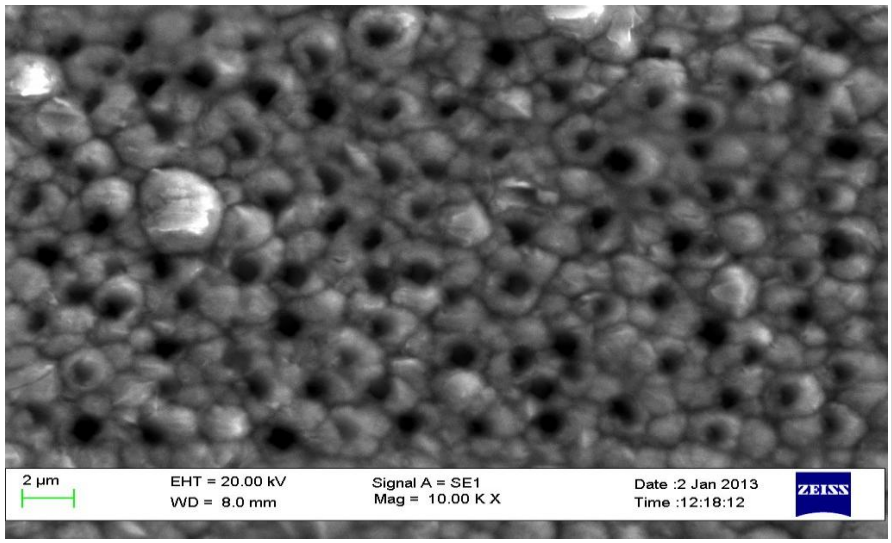
ABOVE SHOWN IS THE ELEMENTAL MAPPING which shows two spectrums viz: SPECTRUM 1 and SPECTRUM 2
From elemental mapping we can clearly see that the CARBON WEIGHT % at SPECTRUM 2 is very high around 80 % and presence of very low Ni % which indicates and proves the presence of diamond particle over there





S.E.M Image Of The Uniformly Deposited Equiaxed NANOCRYSTALLINE Ni(With 6 MICRON DIAMOND PARTICLES EMBEDDED OVER IT) On The Cu Substrate At Different Magnifications Of 10 Micron And 1 Micron

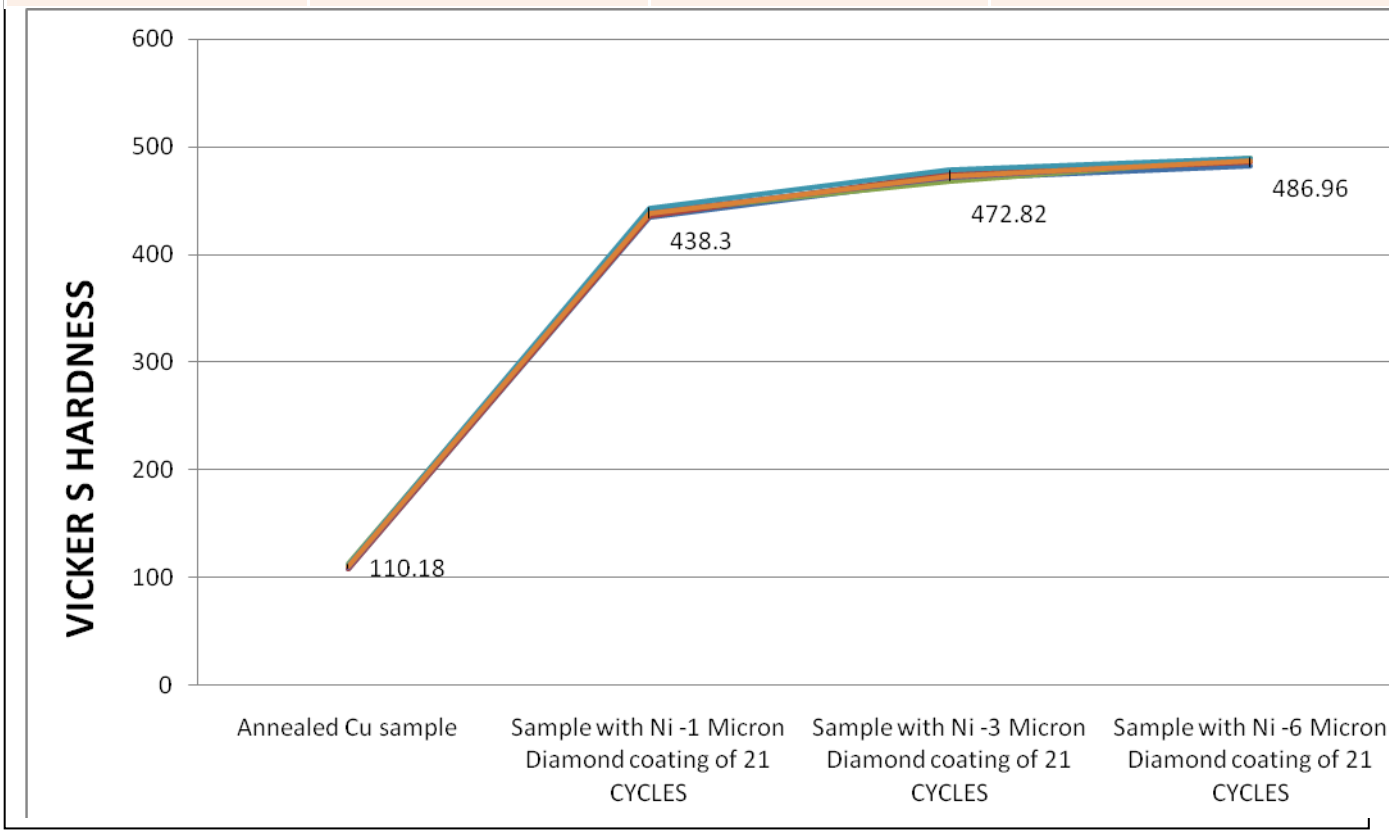
Experimental parameter III - 1 MICRON DIAMOND 21 CYCLES DEPOSITION



S.E.M image of the uniformly deposited equiaxed nano crystalline Ni(with 1 MICRON DIAMOND PARTICLES) EMBEDDED OVER IT) on the annealed Cu substrate at magnification 2 micron

MEASURMENT OF VICKERS HARDNESS OF THE SAMPLES -

ANNEALED COPPER SAMPLE	NI- 1 MICRON DIAMOND COATING 21 CYCLES	NI- 3 MICRON DIAMOND COATING 21 CYCLES	NI- 6 MICRON DIAMOND COATING 21 CYCLES
108.5	433.8	469.8	481.7
108.3	435.6	475.2	485.6
112.6	439.2	468.5	489.6
109.7	439.6	472.5	488.6
111.8	443.3	478.1	489.3
AVERAGE =110.18	AVERAGE =438.3	AVERAGE = 472.82	AVERAGE = 486.96



VARIATION IN THE VALUE OF VICKERS HARDNESS OF THE ANNEALED COPPER SAMPLE ON THE ELECTRODEPOSITION OF NANOCRYSTALLINE NICKEL

III. CONCLUSION

The enhanced content of nanocrystalline Ni with increased current density of around 200 mA/cm^2 allows achieving enhanced hardness in comparison to that of low Ni deposits. Tremendous increase in the value of Vickers hardness of the annealed copper substrate is noticed on the electrodeposition of nanocrystalline film of Ni coated with micron sized diamond particles . The best result of the increased values of hardness was found with 6 micron diamond embedded nanocrystalline Ni film on the annealed copper sample .So Superior Ni-Diamond coatings, with improved corrosion resistance and hardness, can been developed on an annealed copper substrate These coatings can be used in single and multilayer electronic packaging, enhancing mechanical properties of surfaces, mining, and ship building However, it is important to note that superior corrosion resistance can only be possible when the nanocrystalline films are dense and defect free.

REFERENCES

[1] V.P. Glibin, B.V. Kuznetsov, and T.N. Vorobyova, J.
[2] Alloys & Compounds, 386 (2005),
[3] E. Pellicer et al., Proc. in the International Conference
[4] on Advanced Materials (Zurich: IRIS, 2009),
[5] H. Natter and R. Hempelmann, Electrochemica
[6] Acta, 49 (2003),
[7] M. Troyon and L. Wang, Appl. Surf. Sci., 103 (1996),
[8] T. Miyake et al., Thin Solid Films, 397 (2001),
[9] I. Baskaran et al., Mater. Lett.,60 (2006), pp. 1990–
[10] 1995.
[11] X. Chui and W. Chen, J. Electrochemical Society,