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Contents:

Instant fracture detection using ir-rays

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ABSTRACT:

Automatic detection of fractures from IR images is considered as an important process in medical image analysis by both orthopedic and radiologic point of view. X-Ray is one of the oldest and frequently used devices, as they are non-invasive, painless and economical. A bone x-ray makes images of any bone in the body and a typical bone ailment is the fracture, which are cracks in bones. Detection and correct treatment of fractures are considered important, as a wrong diagnosis often lead to ineffective patient management, increased dissatisfaction and expensive litigation. This paper proposes a fusion-classification technique for automatic fracture detection from bones, in particular the hand bones. The proposed system has four steps, namely, preprocessing, segmentation, feature extraction and bone detection, which use an amalgamation of image processing techniques for successful detection of fractures. The results from various experiments prove that the proposed system is shows significant improvement in terms of detection rate and speed of classification.

INDEX TERMS: *Preprocessing, Segmentation, Filtering, Thinning, Classifiers.*

I.   INTRODUCTION

Medical image processing is a field of science that is gaining wide acceptance in healthcare industry due to its technological advances and software breakthroughs. It plays a vital role in disease diagnosis and improved patient care and helps medical practitioners during decision making with regard to the type of treatment. Several state-of-the-art equipments produce human organs in digital form. Examples of such devices include X-Ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasound (US), Positron Emission Tomography (PET) and Single Photon Emission Computed Tomography (SPECT). Out of these, X-Ray is one the oldest and frequently used devices, as they are non-invasive, painless and economical. A bone x-ray makes images of any bone in the body, including the hand, wrist, arm, elbow, shoulder, foot, ankle, leg (shin), knee, thigh, hip, pelvis or spine [2]. A typical bone ailment is the fracture, which occurs when bone cannot withstand outside force like direct blows, twisting injuries and falls. Fractures are cracks in bones and are defined as a medical condition in which there is a break in the continuity of the bone. Detection and correct treatment of fractures are considered important, as a wrong diagnosis often lead to ineffective patient management, increased dissatisfaction and expensive litigation. The importance of fracture detection comes from the fact that in clinical practice, a tired radiologist has been found to miss fracture cases after looking through many images containing healthy bones [1]. Computer detection of fractures can assist the doctors by flagging suspicious cases for closer examinations and thus improve the timeliness and accuracy of their diagnosis. An automatic fracture detection system consists of three main steps, namely, preprocessing, segmentation and fracture detection. Preprocessing consists of procedures that enhance the x-ray input image in a way that its result improves the fracture detection process. The segmentation process consists of two steps. The first step separates the bone structure from the IR image and the second step identifies the diaphysis region from the segmented bone structure. The third step, that is, Fracture Detection determines the presence or absence of fracture in the segmented image. In fracture detection applications, detecting a fracture accurately is often a difficult and challenging task.

II.   PRINCIPLE

The principle behind bone detection using Infrared Imaging works is very simple. NIR spectrum light takes advantage of the optical window in which skin, tissue, and bone are mostly transparent to NIR light in the spectrum of 700-900 nm, while hemoglobin (Hb) and deoxygenated-hemoglobin (deoxy-Hb) are stronger absorbers of light..

Fig 1. Prototype Model

Differences in the absorption spectra of deoxy-Hb and oxy-Hb allow the measurement of relative changes in hemoglobin concentration through the use of light attenuation at multiple wavelengths. The figure 1 shows the block diagram of the proposed model.   The part to be tested is captured by the IR camera, then the image is processed by using MATLAB. The initial step is to enhance the contrast of image, subsequently the noises are removed by filtering process. Then Region of interest(ROI) is cropped for further process, where the image is binarized which helps in determining the structure of the bone. The advantage that Biometrics presents is that the information is unique for each individual and that it can identify the individual in spite of variations in the time (it does not matter if the first biometric sample was taken year ago).
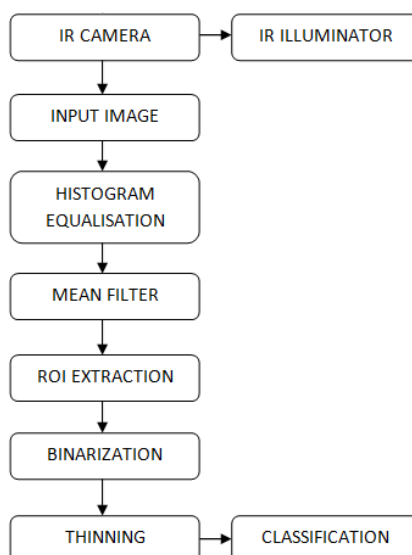
Fig 2. Block Diagram

III.   PREPROCESSING

Pre-processing is a common name for operations with images at the lowest level of abstraction -- both input and output are intensity images. The aim of pre-processing is an improvement of the image data that suppresses unwanted distortions or enhances some image features important for further processing. There are two process carried out in pre-processing:
A.   *Adaptive Histogram Equalization(AHE)*
B.   *Filtering*

A. ADAPTIVE HISTOGRAM EQUALIZATION:

The important step in preprocessing is the histogram equalization. This is an extension to traditional Histogram Equalization technique. It enhances the contrast of images by transforming the values in the intensity image. Unlike histogram equalization, it operates on small data regions (tiles), rather than the entire image. Each tile's contrast is enhanced, so that the histogram of the output region approximately matches the specified histogram. The neighboring tiles are then combined using bilinear interpolation in order to eliminate artificially

induced boundaries. The contrast, especially in homogeneous areas, can be limited in order to avoid amplifying the noise which might be present in the image [3].

Captured Image   *AHE*
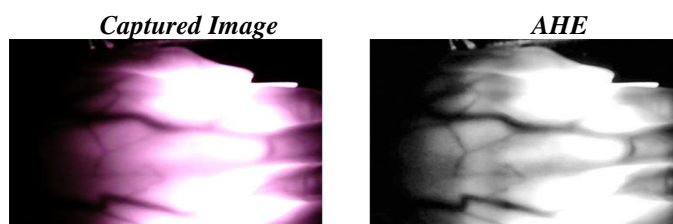
Fig.3 Histogram Equalization stage

B. FILTERING

Filtering is a technique for modifying or enhancing an image. For example, you can filter an image to emphasize certain features or remove other features. Image processing operations implemented with filtering include smoothing, sharpening, and edge enhancement. Here we have used mean filtering enhancement. Here we have used mean filtering.

AHE   *Filtered output*
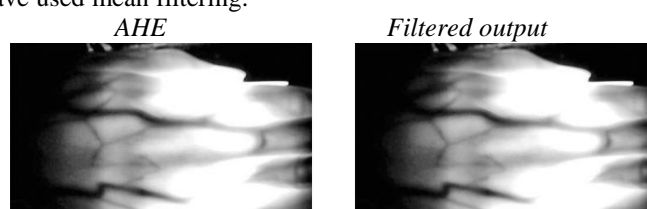
Fig.4 Filtering stage

- **MEAN FILTER:**

Mean filtering is a simple, intuitive and easy to implement method of smoothing images, i.e. reducing the amount of intensity variation between one pixel and the next. It is often used to reduce noise in images [4]. The idea of mean filtering is simply to replace each pixel value in an image with the mean (`average') value of its neighbors, including itself. This has the effect of eliminating pixel values which are unrepresentative of their surroundings.

IV. SEGMENTATION

Segmentation partitions an image into distinct regions containing each pixels with similar attributes. To be meaningful and useful for image analysis and interpretation, the regions should strongly relate to depicted objects or features of interest. Image segmentation is a process in which regions or features sharing similar characteristics are identified and grouped together. Meaningful segmentation is the first step from low-level image processing transforming a greyscale or colour image into one or more other images to high-level image description in terms of features, objects, and scenes. The success of image analysis depends on reliability of segmentation, but an accurate partitioning of an image is generally a very challenging problem.
Segmentation has one main objectives:

1) The one objective is to crop the image for further analysis known as Region of Interest (ROI).

C. REGION OF INTEREST

A region of interest (ROI) is a portion of an image that you want to filter or perform some other operation on, which is a binary image that is the same size as the image you want to process with pixels that define the ROI set to 1 and all other pixels set to 0. You can define more than one ROI in an image.

Original image   *Cropped image*
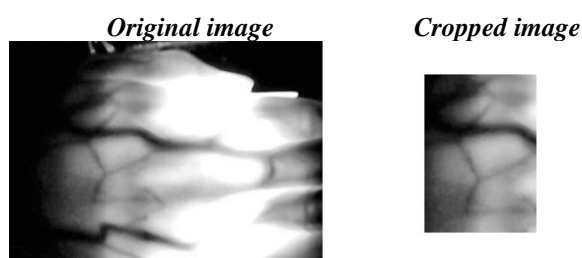
Fig.5 Auto cropping result

The regions can be geographic in nature, such as polygons that encompass contiguous pixels, or they can be defined by a range of intensities. In this case we have used the pixels to crop the region of interest.

In this stage the ROI is determined using auto cropping approach. Using cropping we segment the image smoothly. Image cropping process is less complexity in process and time, since the area under process will be reduced. Two types of cropping technique were used; manual and automatic cropping. Manual cropping is achieved using Matlab® function (imcrop), but it may cause false cropping rectangle and it is tedious work [5]. While automatic cropping is saving more work and it is reducing a processing time over and above the cropping rectangle is truly detecting.

V.   BINARIZATION

The Binarization technique is aimed to be used as a primary phase in various manuscript analysis, processing and retrieval tasks. So, the unique manuscript characteristics, like textual properties, graphics, line drawings and complex mixtures of the layout-semantics should be included in the requirements. On the other hand, the technique should be simple while taking all the document analysis demands into consideration. The threshold evaluation techniques are adapted to textual and non-textual area properties, with the special tolerance and detection to different basic defect types that are usually introduced to images. The outcome of these techniques represents a threshold value proposed for each pixel. These values are used to collect the final outcome of the binarization by a threshold control module [6].The Simplest method for image binarization is thresholding. The output of the thresholding process is a binary image whose gray level value 0 (black) will indicate a pixel belonging to a print, legend, drawing, or target and a gray level value 1 (white) will indicate the background. Thresholding divides the image into patches, and each patch is thresholding by a threshold value that depends on the patch contents [7]. In order to decrease the effects of noise, common practice is to first smooth a boundary prior to partitioning.To perform a change of representation, to achieve this we have used a thresholding algorithm known as Otsu's algorithm.

D. Otsu's ALGORITHM

Otsu's method is used to automatically perform clustering-based image thresholding, or, the reduction of a graylevel image to a binary image. The algorithm
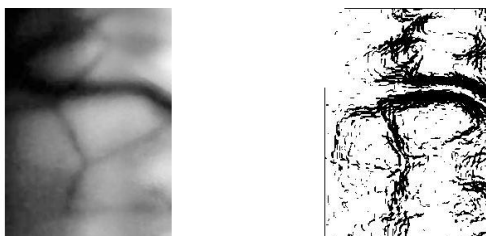
Fig.5 Binarized Output

assumes that the image contains two classes of pixels following bi-modal histogram (foreground pixels and background pixels), it then calculates the optimum threshold separating the two classes so that their combined spread (intra-class variance) is minimal.

VI.   THINNING

Thinning is an image processing operation in which binary valued image regions are reduced to lines that approximate the center skeletons of the regions [8]. It is usually required that the lines of the thinned result are connected for each single image region, then these can be used to infer shape and topology in the original image. Thinning techniques have been applied in many fields such as automated industrial inspection, pattern recognition, biological shape description and image coding etc. the main objective of thinning is to improve efficiency, to reduce transmission time [9]. The skeleton of an object is a line connecting the points midway between the boundaries. The skeleton refers to the "bone" of an image.

VII.   CLASSIFIERS

Classification includes a broad range of decision-theoretic approaches to the identification of images (or parts thereof). All classification algorithms are based on the assumption that the image in question depicts one or more features and that each of these features belongs to one of several distinct and exclusive classes [10]. The classes may be specified a priori by an analyst (as in supervised classification) or automatically clustered into sets of prototype classes, where the analyst merely specifies the number of desired categories.

The intent of the classification process is to categorize all pixels in a digital image into one of several land cover classes, or "themes". This categorized data may then be used to produce thematic maps of the land cover present in an image. Normally, multispectral data are used to perform the classification and, indeed, the spectral pattern present within the data for each pixel is used as the numerical basis for categorization.

CONCLUSION

This paper proposes new approach of fracture detection at emergencies. It is compact, reliable and very cost effective when compared to conventional methods of detection. These results are promising at this particular wavelength (450nm). Further we are planning to improve our results with different IR wavelengths and various algorithms to improve the quality of the resultant output.

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Ultrasonic velocity and allied parameters of tetrahexylammonium iodidein binary mixtures of N, N-dimethylformamide and ethylmethylketone at different temperatures

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ABSTRACT:

Ultrasonic velocity, viscosity and density studies on solution of tetrahexylammonium Iodide (Hex$_4$NI) have been carried out in N,N-dimethylformamide (DMF), ethylmethylketone (EMK) and DMF-EMK solvent mixtures containing 0, 20, 40, 60, 80 and 100 mol % of DMF at 298, 308 and 318K. From the velocity, viscosity and density data values, various parameters namely, the adiabatic compressibility (β), Intermolecular free length (L$_f$), specific acoustic impedance (Z), free volume (V$_f$), internal pressure (π$_i$)and relaxation time (τ) have been calculated. All these parameters have been discussed separately to throw light on the solute-solvent and solvent-solvent interactions.

KEYWORDS: *Adiabatic compressibility, intermolecular free length, specific acoustic impedance, free volume, internal pressure, relaxation time.*

I. INTRODUCTION:

Ultrasonic study of liquids is a useful technique for understanding its physico-chemical properties. In recent years, ultrasonic velocity studies in many of the aqueous[1-2],pure non-aqueous[3-5] and mixed[6-8] electrolytic solutions have led to new insights into the process of ion-ion and ion-solvent interactions. Only very little experimental data on the solvation behavior of ions are available in mixed non-aqueous solvents[9]. Whenever studies in mixed non-aqueous solvents are reported, attention has never given to the mutual interactions of the solvent molecules. Recently, ionic interactions and ion-solvent interactions for the tetraalkylammonium salts have been reported[11-14] from density and viscosity measurements.

Viscosity, density and ultrasonic velocity measurements and allied parameters derived from these are excellent tools to detect solute-solute and solute interactions. Such interactions have been studied in DMF and EMK mixture by usingHex$_4$NI as solute.

Ultrasonic velocities, densities and viscosities are measured over the entire composition range at 298, 308and 318K in order to understand the molecular interactions between the participating of components of these mixtures. Using the experimental data, various acoustical parameters like adiabatic compressibility (β), specific acoustic impedance (Z), intermolecular free length (L$_f$), viscous relaxation time (τ), free volume and internal pressure (π$_i$) are estimated. These parameters are used to interpret the intermolecular interactions such as solute–solvent and solute-solute interactions existing between these two components of binary mixtures.

II. EXPERIMENTAL:

Ultrasonic velocity were measured using interferometer (Model-81, supplied by Mittal Enterprises, New-Delhi) operating at afrequency of 1 MHz, which is a direct and simple device for measuring ultrasonic velocity in liquids.

Density measurement were carried out within a precision of ±0.01% using sealable pycnometer of capacity 20cm^3, of pure solvents as well as solvent mixtures in a water thermostat, whose temperature was kept constant within the range of ±0.5%.

Viscosity measurement were carried out with a precision of ±0.2% by using an calibrated Ubbelehode bulb level viscometer, whose flow time for doubly distilled water was found to be 584.2 ± 0.1 s at 298.15 K. No kinetic energy correction was applied as the flow time was greater than 400 s. The values of viscosity and density of pure EMK and DMF were found to be in good agreement as reported in literature[6,14-16].

Water required for the calibration of the viscometer, pycnometer and ultrasonic velocity liquid cell was twice distilled over acidified $KMnO_4$ through a 750 mm long vertical fractionating column. Middle fraction of about 800-1000 ml was collected and stored in coloured bottle for use. The conductivity of distilled water was found to be 1-2 x 10^{-6} s. The value of ultrasonic velocity for the conductivity water was found to be 1490 m/s at 298.15 K at 1 MHz, which is agreed well with literature value[6,14-16].

Dimethylformamide(DMF) and ethylmethylketone (EMK) (both from Research Laboratories Pvt Ltd Bombay) have been purified by the methods reported earlier[14-16].

Tetrahexyl ammonium iodide (Hex₄NI) of analytical grade, Fluka, was dried and used as described earlier[6,14].

Different acoustical parameters such as adiabatic compressibility(β), specific acoustic impedance (Z), intermolecular free length (L_f), free volume (V_f), internal pressure(π_i) and viscous relaxation time (τ) have been calculated at different temperatures, with the help of ultrasonic velocity (u), density(ρ) and viscosity(η) values using the following relations[14,17-20]:

Adiabatic compressibility (β):
The adiabatic compressibility values for various compositions of the binary solvent mixtures have been calculated from the measured ultrasonic velocities (u) and densities (ρ)

$$\beta = \frac{1}{u^2 \rho}$$

Acoustic Impedance (Z):
The specific acoustic impedance is related to density and ultrasonic velocity by the relation:
$$Z = u\rho$$

Free length (L_f) :
The free length in a solvent mixture is related to ultrasonic velocity and density as:

$$L_f = K_T \sqrt{\beta}$$
where K_T is time dependent constant whose value is 199.53x10^{-8} in MKS system.

Free Volume (V_f):
The free volume of binary mixture is given by
$$V_f = \left[\frac{M_{eff} u}{K\eta}\right]^{3/2}$$
where K is time independent constant whose value is 4.28 x 10^9 in MKSsystem and M_{eff}effective molecular weight of the liquid is given by
$$M_{eff} = X_1 M_1 + X_2 M_2$$
where X_1& X_2 are the mole fraction of first and second components and M_1 & $M_2$are the molecular weights of first and second components respectively.

Internal Pressure (π_i):
Internal pressure is given by
$$\pi_i = \frac{bRT[K'\eta]^{\frac{1}{2}}}{M_{eff}^{\frac{7}{6}}} \rho^{\frac{2}{3}}$$
where, b is the cubic packing factor which is assumed to be 2 in liquid systems.

K = 4.28 x 10^9 and is independent to the nature of liquid.

R is gas constant.

Relaxation Time (τ):
Relaxation can be calculated from viscosity coefficient (η), density and ultrasonic velocity of binary mixtures and given by

$$\tau = \frac{4\eta}{3\rho u^2}$$

III.   RESULTS AND DISCUSSION:

The ultrasonic velocity, density and viscosity were measured forHex₄NI in DMF, EMK and EMK+DMF mixtures containing 0, 10, 20, 30, 40, 50, 60,70, 80, 90, 100 mol% of DMF in concentration range (0.02 - 0.1) mol dm⁻³ at 298, 308 and 318K.

The density, viscosity and ultrasonic velocity were found to vary linearly with solvent composition. Their values are, however, maximum in pure DMF and decrease with increaseof EMK content. This trend suggests that the molecular interactions are more at higher concentration of DMF in the binary mixture. With the increase in temperature, decrease in velocity, density and viscosity observed. This trend reveals that at higher temperature the molecular interactions between the components are low.

With increase in solute concentration, an increase in density, viscosity and ultrasonic velocity is observed. This may be interpreted to the structure former of the solvent due to the added solute and strong solvent-solvent and solute-solvent interactions.

Acoustical Parameters:

The experimentally determined values of ultrasonic velocity (u), density (ρ) and viscosity (η) along with calculated values of different acoustical parameters such as adiabatic compressibility (β), specific acoustic impedance (Z), intermolecular free length (L_f), free volume (V_f), internal pressure (π_i) and viscous relaxation time (τ),at different temperatures are reported in the table 1.

Table -1:Summary of experimental data:concentration (c),density (ρ), ultrasonicvelocity (u), viscosity (η)and the derived acoustical parameters of Hex₄NIin DMF-EMK mixtures at different temperatures.

Temperature	c	u (ms⁻¹)	ρ (Kg m⁻³)	ηx10⁻³ (Nm⁻²s)	βx10¹¹ (Kg⁻¹m s⁻¹)	Zx10⁻³ (Kg⁻¹m⁻²s⁻¹)	L_fx10¹² (m)	τx10¹¹ (s)	V_f x10⁸ (m³mol⁻¹)	πi (atm)
					100% DMF					
	0.00	1456.70	944.40	0.8025	49.90	1375.71	44.57	53.39	17.26	48.37
	0.02	1458.10	945.73	0.8259	49.73	1378.97	44.50	54.77	16.49	49.25
298K	0.04	1459.30	947.05	0.8480	49.84	1382.03	44.43	56.06	15.80	50.08
	0.06	1460.30	948.37	0.8696	49.45	1384.91	44.37	57.33	15.17	50.90
	0.08	1460.90	949.68	0.8916	49.34	1387.39	44.32	58.65	14.56	51.74
	0.10	1461.50	950.99	0.9120	49.23	1389.87	44.27	59.86	14.03	52.54
	0.00	1424.20	934.60	0.7103	52.75	1331.06	45.82	49.96	20.04	47.23
	0.02	1425.70	935.91	0.7314	52.57	1334.33	45.75	51.26	190.13	48.10
308K	0.04	1427.00	937.22	0.7502	52.40	1337.41	45.67	52.41	18.37	48.89
	0.06	1428.20	938.52	0.7687	52.24	1340.39	45.60	53.54	17.66	49.67
	0.08	1429.10	939.82	0.7866	52.10	1357.39	45.54	54.64	17.01	50.43
	0.10	1429.8	941.12	0.8046	51.98	1345.61	45.89	55.78	16.37	51.22
	0.00	1386.70	925.80	0.6348	56.17	1283.81	47.29	47.54	22.78	46.43
	0.02	1388.40	927.09	0.6535	55.96	1287.17	47.20	48.76	21.76	47.28
318K	0.04	1389.90	928.38	0.6647	55.76	1290.36	47.12	49.76	20.95	48.00
	0.06	1391.30	929.66	0.6847	55.57	1293.44	47.04	50.73	20.19	48.73
	0.08	1392.50	930.94	0.7002	55.40	1296.33	46.96	51.72	19.48	49.45
	0.10	1393.60	932.22	0.7151	55.23	1299.14	46.89	52.66	18.81	50.17
					80%DMF					
	0.00	1402.80	913.80	0.6987	55.61	1281.88	47.05	51.81	20.07	44.99
	0.02	1404.30	915.45	0.7199	55.39	1285.57	46.96	53.17	19.14	45.84
298K	0.04	1405.60	917.09	0.7387	55.19	1289.06	46.87	54.36	18.38	46.61
	0.06	1406.60	918.72	0.7566	55.01	1292.27	46.80	55.50	1767	47.37
	0.08	1407.50	920.35	0.7762	54.85	1295.39	46.73	56.76	16.96	48.16
	0.10	1408.30	921.97	0.7956	54.69	1298.41	46.66	58.01	16.29	48.96
	0.00	1368.40	904.10	0.6118	59.07	1237.17	48.49	48.18	23.61	43.74
	0.02	1370.00	905.69	0.6321	58.83	1240.80	48.39	49.58	22.42	44.63
308K	0.04	1371.60	907.28	0.6487	58.59	1244.43	48.30	50.67	21.52	45.38
	0.06	1372.80	908.87	0.6650	58.38	1247.70	48.21	51.77	20.68	46.13
	0.08	1374.10	910.46	0.6808	58.17	1251.06	48.12	52.80	19.91	46.84
	0.10	1375.10	912.04	0.6966	57.99	1254.15	48.05	53.86	19.18	47.58
	0.00	1334.80	894.80	0.5408	62.73	1194.38	49.97	45.23	27.36	42.70
	0.02	1336.60	896.42	0.5579	62.44	1198.16	49.86	46.45	26.06	43.53
318K	0.04	1338.20	898.03	0.5720	62.18	1201.74	49.76	47.42	25.05	44.24
	0.06	1339.70	899.64	0.5851	61.93	1205.25	49.66	48.32	24.16	44.91
	0.08	1341.00	901.24	0.5981	61.70	1208.56	49.56	49.21	23.31	45.57

	0.10	1342.10	902.84	0.6109	61.49	1211.70	49.48	50.09	22.52	46.25
				60%DMF						
	0.00	1351.10	884.80	0.6058	61.91	1195.45	49.65	50.01	23.50	41.78
	0.02	1352.80	886.71	0.6249	61.62	1199.54	49.53	51.35	22.39	42.60
298K	0.04	1354.20	888.61	0.6412	61.36	1203.36	49.43	52.46	21.49	43.32
	0.06	1355.50	890.51	0.6574	61.12	1207.09	49.33	53.57	20.64	44.05
	0.08	1356.80	892.41	0.6539	60.87	1210.82	49.23	54.69	19.84	44.78
	0.10	1357.90	894.30	0.6912	60.64	1214.37	49.14	55.89	19.04	45.54
	0.00	1316.00	874.60	0.5295	66.02	1150.97	51.27	46.61	27.65	40.59
	0.02	1317.70	876.52	0.5455	65.71	1154.99	51.15	47.79	26.39	41.36
308K	0.04	1319.20	888.43	0.5590	64.68	1172.02	50.74	48.21	25.38	42.36
	0.06	1320.70	880.34	0.5721	35.12	1162.67	50.92	49.68	24.45	42.70
	0.08	1322.00	882.24	0.5857	64.86	1166.32	50.81	50.65	23.55	43.38
	0.10	1323.20	884.14	0.5985	64.60	1169.89	50.71	51.55	22.73	44.04
	0.00	1275.80	864.70	0.4633	71.05	1103.18	53.19	43.89	32.25	39.51
	0.02	1277.60	866.64	0.4792	70.69	1107.22	53.05	45.17	30.59	40.34
318K	0.04	1279.30	868.58	0.4913	70.35	1111.17	52.92	46.08	29.42	41.01
	0.06	1280.90	870.51	0.5031	70.02	1115.04	52.80	46.97	28.32	41.66
	0.08	1282.30	872.44	0.5142	69.71	1118.73	52.68	47.79	27.35	42.67
	0.10	1283.60	874.35	0.5252	69.41	1122.32	52.57	48.61	26.42	42.92
				40%DMF						
	0.00	1300.10	856.30	0.5210	69.09	1113.28	52.45	48.00	27.82	38.64
	0.02	1301.80	858.51	0.5349	68.73	1117.61	52.31	49.02	26.68	39.32
298K	0.04	1303.30	860.70	0.5476	68.40	1121.75	52.18	49.94	25.70	39.95
	0.06	1304.70	862.90	0.5603	68.08	1125.83	52.06	50.86	24.77	40.59
	0.08	1306.10	865.10	0.5728	67.76	1129.91	51.94	51.75	23.91	41.21
	0.10	1307.10	867.29	0.5855	67.49	1133.64	51.83	52.68	23.07	41.86
	0.00	1263.80	846.00	0.4554	74.01	1069.18	54.28	44.94	32.62	37.57
	0.02	1265.50	848.20	0.4719	73.62	1073.40	54.14	46.32	30.86	38.41
308K	0.04	1267.20	850.38	0.4851	73.23	1077.60	54.00	47.37	29.56	39.10
	0.06	1268.80	852.56	0.4969	72.86	1081.73	53.86	48.27	28.44	39.74
	0.08	1270.20	854.74	0.5089	72.51	1085.69	53.73	49.20	27.83	40.39
	0.10	1271.50	856.91	0.5205	72.18	1089.56	53.61	50.09	26.40	41.03
	0.00	1222.50	835.30	0.3940	80.11	1021.15	56.47	42.08	38.57	36.37
	0.02	1224.30	837.52	0.4101	79.66	1025.38	56.31	43.56	36.25	37.27
318K	0.04	1226.10	839.73	0.4212	79.22	1029.59	56.19	44.49	34.77	37.92
	0.06	1227.80	841.93	0.4318	78.79	1033.72	56.01	45.36	33.43	38.56
	0.08	1229.40	844.13	0.4420	78.38	1037.77	55.86	46.19	32.21	39.18
	0.10	1230.80	846.33	0.4518	78.00	1041.66	55.73	46.99	31.09	39.78
				20%DMF						
	0.00	1245.70	827.50	0.4467	77.88	1030.82	55.68	46.38	32.86	35.73
	0.02	1247.30	830.01	0.4602	77.44	1035.27	55.53	47.52	31.36	36.43
298K	0.04	1248.80	832.51	0.4721	77.02	1039.64	55.38	48.48	30.12	37.06
	0.06	1250.20	835.00	0.4834	76.62	1043.92	55.23	49.39	29.00	37.68
	0.08	1251.50	837.49	0.4954	76.24	1048.12	55.09	50.36	27.88	38.32
	0.10	1252.70	839.98	0.5080	75.86	1052.24	54.96	51.85	26.78	38.99
	0.00	1206.40	817.50	0.3914	84.05	986.23	57.85	46.86	38.19	34.84
	0.02	1208.10	819.99	0.4080	83.56	990.63	57.68	45.46	35.81	35.74
308K	0.04	1209.80	822.47	0.4201	83.07	995.03	57.51	46.53	34.21	36.42
	0.06	1211.30	824.95	0.4310	82.62	999.26	57.35	47.48	32.85	37.06
	0.08	1212.80	827.42	0.4417	82.17	1003.50	57.19	48.39	31.60	37.68
	0.10	1214.30	829.89	0.4523	81.72	1007.74	57.04	49.28	30.42	38.31
	0.00	1165.00	806.50	0.3365	91.36	939.57	60.31	40.99	45.46	33.64
	0.02	1166.70	809.00	0.3504	90.81	943.86	60.13	42.43	42.70	34.48
318K	0.04	1168.40	811.50	0.3602	90.27	948.16	59.95	43.35	40.90	35.11
	0.06	1170.00	813.99	0.3690	89.74	952.37	59.77	44.15	39.36	35.70
	0.08	1171.60	816.48	0.3776	89.23	956.59	59.60	44.92	37.95	36.28
	0.10	1173.00	818.97	0.3859	88.74	960.65	59.44	45.66	36.65	36.84

0%DMF(Pure EMK)									
298K	0.00	1195.60	799.90	0.3855	87.46	956.36	59.01	44.95	38.54	33.12
	0.02	1197.10	802.69	0.3972	86.93	960.90	58.83	46.04	36.77	33.78
	0.04	1198.50	805.48	0.4075	86.43	965.37	58.66	46.96	35.31	34.39
	0.06	1199.90	808.26	0.4173	85.93	969.83	58.49	47.81	33.99	34.97
	0.08	1201.20	811.04	0.4274	85.45	974.22	58.33	48.70	31.72	35.56
	0.10	1202.40	813.81	0.4385	84.99	978.53	58.17	49.69	31.40	36.20
308K	0.00	1153.30	788.80	0.3441	95.31	909.72	61.60	43.73	43.30	32.63
	0.02	1154.90	791.58	0.3577	94.71	914.20	61.41	45.17	40.77	33.43
	0.04	1156.40	794.36	0.3678	94.14	918.60	61.22	46.17	39.03	34.06
	0.06	1157.90	797.12	0.3771	93.57	922.99	61.03	47.05	37.51	34.65
	0.08	1159.30	799.89	0.3862	93.02	927.31	60.86	47.90	36.12	35.24
	0.10	1160.00	802.65	0.3952	92.59	931.07	60.71	48.79	34.78	35.83
318K	0.00	1110.30	776.60	0.2975	104.45	862.26	64.49	41.43	50.09	31.59
	0.02	1111.90	779.40	0.3100	103.78	866.61	64.28	42.89	47.74	32.41
	0.04	1113.40	782.19	0.3186	103.13	870.89	64.08	43.81	45.73	33.01
	0.06	1114.90	784.99	0.3265	102.49	875.19	63.88	44.62	43.99	33.58
	0.08	1116.30	787.78	0.3342	101.87	879.40	63.68	45.39	42.39	34.14
	0.10	1117.80	790.56	0.3414	101.24	883.69	63.49	46.08	40.97	34.68

Adiabatic Compressibility

The adiabatic compressibilities (β) have been evaluated at 298, 308 and 318K of the electrolyte solutions reported in Table-1. It may be noted that a slight decrease in the adiabatic compressibility (β) is observed with increase in concentration of Hex_4NI at all the temperatures. This decrease can be interpreted in terms of electrostatic effect of the solute on the surrounding solvent molecules, which results to relatively incompressible. This also gives an indication of the fact that decrease in compressibility is due to electrostriction effect i.e. caused by solute at a particular ionic strength and dielectric constant of the medium. This observation is consistent with some previous works[21-22].

The adiabatic compressibility (β) increases with the increase in content of EMK in the mixture at all the temperatures. This trend shows that the molecular attraction are more at lower concentration of EMK and higher concentrations the attractions are less due to steric hindrance and for EMK+DMF system the dipole- dipole interactions/associations between EMK and DMF molecules are more at higher temperature than at lower temperature.Similar observations were made by Patial[14], Syalet al[20] and Kumar et al[23]. With the increase of temperatures, β- values of mixture increase, indicating temperature dependence of β and increase of interactions between molecules of solvents mixture.

Acoustic Impedance (Z)

The acoustic impedance (Z) values of Hex_4NI in DMF, EMK and DMF-EMK mixtures have been evaluated for different concentrations at different temperatures from the velocity and density data using equation given earlier. The calculated Z values given in the Table-1 for various compositions show a gradual increase with increase in concentration of solute in DMF, EMK and DMF-EMK mixtures. This is in agreement with theoretical requirement as both ultrasonic velocity (u) and density (ρ) increase with the increase of concentration salt. Linear increase of Z with concentration can be attributed to the presence of strong solute-solvent interaction.With increase of temperature, Z values decrease for all the studied mixtures, this is in accordance with u and ρ, as both u and ρ decrease with increase with temperature.

The acoustic impedance (Z) values decrease with the decrease of DMF content to EMK+DMF mixture. This may be due to change of intermolecular and solute – solvent interaction between EMK and DMF molecules with the addition of EMK to DMF in mixture[14,24].

IntermolecularFree Length (L_f)

The free length of system is a measure of intermolecular interaction between the components in the binary mixtures. The increase in free length indicates weakening of intermolecular attraction. The velocity of ultrasonic waves should increase if the intermolecular free length decreases as a result of mixing of two components. Erying and Kincaid[25] have proposed that L_f is a predominating factor in determining the variation of ultrasonic velocityin solutions. The change in free length also indicates that there is significant interaction between the solute and solvent molecules due which structural arrangement is also affected.

The calculated values of intermolecular free length (L_f) of the studied solution solutions for Bu_4NBr at different temperatures are presented in Table-1. The intermolecular free length (L_f) values decreases with increase of salt concentration and increase with the decrease of DMF content inDMF-EMK mixtures. The decrease of L_f with increase of concentration suggests the presence of strong solute - solvent interaction[26-27].

L_f values decrease with the increase of DMF content in the DMF-EMK mixtures at all temperatures which show dipole-dipole interactions are more at higher content of DMF in the given system[14,24].

With increase in temperature, the magnitude of L_f increases showing the presence of solute-solvent interactions. Similar observations were made by Syalet al[20], Patial[14] and Ali[24].

Thus relaxation time data which include the values of velocity (u), density (ρ) and viscosity (η) of solution systems are quite valuable in understanding the structure of solution systems, solute-solvent interactions inter-molecular and intra-molecular interactions.

Free Volume (V_f):

It can be defined as the average volume in which the central molecule can move inside the hypothetical cell due to repulsion of surrounding molecules. Free volume can also be referred as the void space between the molecules i.e. volume present as holes of monomeric size, due to irregular packing of molecules.

It is evident from the Table-1 that V_f values in general decrease in magnitude with the increase of concentration of Hex_4NI. However, with the increase of EMK content in EMK-DMF mixture, V_f values increase. Increase of temperature also increases the magnitudes of V_f.

This behavior of V_f is opposite to that observed for internal pressure (π_i) with regard to composition of solvent system and increase of temperature. Similar behavior has been reported in DMSO + H_2O system[28].

Internal Pressure (π_i):

Internal pressure (π_i) is the resultant of forces of attraction and repulsion between solute and solvent molecules of solution.

Internal pressure (π_i) values for Hex_4NI at different temperatures in EMK-DMF mixtures have been calculated by the equation given and have been presented in Table-1.

It is evident from the Table-1 that π_i values increase with increase with increase of solute concentration and decrease with increase of temperature in all composition.

Increase of π_i with concentration of Hex_4NI indicates increase in intermolecular interactions due to the forming of aggregates of solvent molecules around the solute, which affect the structural arrangement of solution system. This may also be attributed to the presence of solute-solvent interactions.

Internal pressure (π_i) values show decreasing trend with the increase of EMK content in the EMK + DMF system and also decrease with rise in temperature. This predicts the presence of solute- solvent interactions.

Internal pressure (πi) decreases with rise in temperature because of thermal agitation of ion from each other due to increasing thermal energy, which reduces the possibility for interactions and reduces the cohesive forces and ultimately leads to a decrease in the internal pressure. Similar observations were made by Chauhanet al[29] and Patial[14].

Relaxation Time (τ):

As per equation given, viscous relaxation time (τ) is directly proportional to viscosity and adiabatic compressibility of solution or solvent system. Hence, viscosity, density and ultrasonic velocity of solution systems play important plays important in evaluation of acoustical relaxation time (τ). The values of viscous relaxation time (τ) for Hex_4NI have been evaluated in DMF-EMK mixtures and have been given in the Table-1 at 298, 308 and 318K.

From the Table-1, it has been found that viscous relaxation time (τ) values increases with increase in concentration of solute in all the studied solvent systems at all the temperatures. Acoustic relaxation time decreases with rise in temperature, in accordance with the increase of temperature.

The relaxation time (τ) values decrease with increase of EMK content in DMF-EMK mixtures. Tis may be account for the decrease of dielectric constant of the medium and change of intermolecular and intra-molecular interactions between the DMF and EMK molecules.

Increase of τ with increase of solute concentration may be attributed to the presence of solute-solvent interaction.

Similar results for PVP polymer as solute in DMSO+H_2O has been reported by Syal et[28] and for tetraalkylammonoum salts by Patialet al[6].

The increase of relaxation time of pyrogallol solution with concentration as reported in literature[30] is also in agreement with our results.

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Survey on Fitness Centres Automation and Development of Mobile Application for Android Platform

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ABSTRACT:

This paper contains the details of research and market survey carried out for the creation of an Android application that automates a fitness centre's entire business process. The various problems faced at different fitness centres are discussed along with relevant proposed resolutions for the same. A comparison of various mobile platforms has been made concluding that android is the most favourable for this application development.

KEYWORDS— Fitness Centre, Business Process Automation, Mobile Application, Android SDK, Cross Platform Tools

I.   INTRODUCTION

The fitness industry is a rapidly evolving business today. Being fit itself has unfolded from a luxury to being a basic need. As a result a large number of fitness centres have mushroomed up across cities. Being individual or small-medium functioning, these centres have rareness of a regularized operations model, with remittance being made in instalments, attendance of client being random, with the fitness regimes following a similar modus operandi. As a result the stakeholders of fitness centres the owners/managers and the customers themselves are at a loss, with the owners/managers facing functioning, compliance and turnover issues, while the customers face issues with their fitness quotients.

Therefore Fitko is a cloud based solution for gyms and fitness centres that digitizes and centralizes all the business processes for fitness managers, giving easy and on the fly access to workout schedule and assessments for members.

The rest of this document describes the market survey conducted to infer the necessity of this product.

II.   MARKET SURVEY

In this section the paper describes the review of current market that was performed as a first step in this work. Though it could find no application that performs exactly the same functions as this application, none the less a lot was learnt through researches into existing systems as well as a brief outlook on the requirement analysis of the fitness industry.

A. Background

Sugoi Labs is a company that aims at transforming business processes into technology processes over the mobile and web. Fitko is one such product developed by Sugoi Labs which makes life of fitness centre owners and members easier via digitization and on the fly access, bringing various business processes of running a fitness centre on to the mobile and cloud for owners/managers, and helps fitness centre members in managing fitness schedules and evaluating regular fitness assessments, thus allowing a very compact system to interact with the centre and trainers.

This project"s ruling aim is to come up with the mobile version of Fitko over the android platform.

B. Existing Systems

A market survey was conducted on the various systems being used by fitness centres. Many centres were visited and it was concluded that there is no existing automated system in India to keep record of the entire

business processes of the fitness centres. Sugoi Labs proposed an idea of a SaaS based solution for the automation of the business process of the fitness centres. Still nothing exists on the mobile platform.

A few surveyed fitness centers are stated below. This helped to not only comprehend the problems requirements involved, but also convinced that this work will have to be implemented from scratch.

Details of centers surveyed:-
Name: Sri Maruthi Core Fitness
Established: 2011
Number of Branches: 2
Average Number of members: 300 (per branch)
Membership charge: Rs 13,000 p.a.
Facilities: General fitness, strength training, free weights, cardio, personal training, aerobics, free trials, physiotherapy
Contact: Arab (manager), 9880394402.
Name: D Sculpt Fitness
Established: 2014
Number of Branches: 1
Average Number of members: Newly opened
Membership charge: Rs 9,999 p.a.
Facilities: Personal training, General fitness, strength training, free weights, cardio, free trials.
Contact: Deepak Gowda, 9916065699

Name: Apple Fitness
Established: 2014
Number of Branches: 1
Average Number of members: Newly opened
Membership charge: Rs 20,000 p.a.
Facilities: General fitness, personal training, strength training, free weights, cardio, aerobics, free trials, steam & shower, cross fit, zumba, functional training zone, power yoga, body pump, body combat.
Contact: Santosh Kumar (manager), 9901625555.

All fitness centres surveyed had variant facilities and business characteristics, but they all had similar problems pertaining to manual conduction of all managerial activities. The following were the sevaral problems faced by all the centres in general:

User management:
- It"s difficult to track number of active members in a particular centre.
- It"s difficult to track number of new members per week/month.

Attendance: The process of keeping check on absenteeism is tedious.

Payment:
- Tracking of partial payments.
- Renewals of payment accounts.

Card based exercise schedule: Manual maintenance and accessibility to user cards is time-consuming.

Regular assessment of each member.

Trainer management: Allotment of a trainer to each member as well as maintaining the trainer-user ratio accurately.

C. Technology Survey
The team chooses to implement mobile app as opposed to a web application because:
Mobile applications are more cost efficient. Fitness centres will have the additional overhead of computer systems, if web application is needed.
Mobile applications are more accessible to all stakeholders.

The chosen platform to work on is android owing to its generic popularity and simplicity of use. Android is the most widely used mobile operating system now-a-days with more users and more phones worldwide than compared to any other operating system. On little research, a few advantages and disadvantages were inferred as cited below:

Advantages:
a. Multitasking
b. Ease of notification
c. Easy access to thousands of applications via the Google Android App market
d. Diverse phone options
e. Can install a modified ROM
f. Widget
g. Google maniac

h. Lower iteration time
Disadvantages:
a. Continuous internet connection
b. Advertising
c. More fragmentation
d. In-app purchases easier on other platforms such as iOS

As shown above, the advantages clearly outweigh the disadvantages and hence our inclination towards using android

Android Architecture

The android system is a Linux based system which uses software stack architecture design pattern. The Android architecture consists of four layers namely Linux kernel, Libraries and Android runtime, Application framework and Applications.
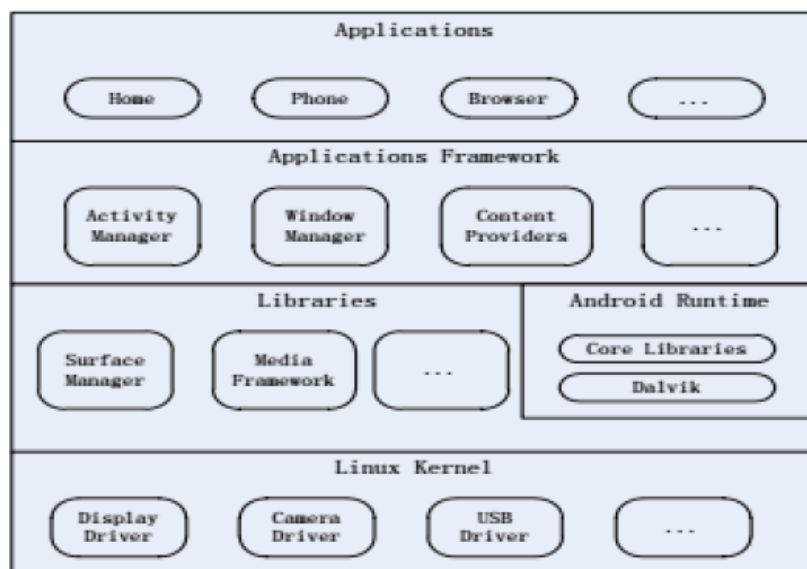
Figure 1. Android Architecture

Applications: The set of core applications that the android app will be shipped with includes client, SMS program, calendars, maps, browsers, contacts and others. These applications are developed using java.

Applications Framework: Android offers developers the ability to build innovative applications by providing an open development platform. Developers can freely take advantage of the device hardware, access location information, run background services, set alarms, add notifications to the status bar, and much more. All the API framework of the core program can be accessed by the developers. This framework specifies the reuse of its component.

Libraries and Android Runtime: The two components in which the library is divided in to are Android libraries and Android Runtime. The Runtime consists of Java core library and Dalvik Virtual Machine. The Library provides Java core library with most functions. Dalvik virtual machine is register virtual machine and makes some specific improvements for mobile device. Android system library is support the application framework; it is also an important link connecting between application framework and Linux

Kernel. This system library is developed in C or C++ language. These libraries can also be utilized by the different components in the Android system. They provide service for the developers through the application framework.

Linux Kernel: The kernel system service provided by Android inner nuclear layer is based on Linux 2.6 kernel; Operations like internal storage, internet protocol, process management, bottom-drive and other core service are all based on Linux kernel. [1]

History of Android and the SDK

Open Handset Alliance which is led by Google created Android. There was mixed feedback on developing applications for the Android platform. The various issues cited include bugs, documentation inadequacy, QA infrastructure, and it was found that there was no public issue-tracking system. Google promulgated an issue tracker on January 18, 2008. Android-targeted applications began to appear the week after the platform was announced. The snake game was the first publicly available application. A SIM-unlocked and hardware-unlocked device that is designed for advanced developers is the Android Dev Phone. Regular consumer devices purchased at retail can be used by developers to test and use their applications; some developers may choose not to use a peddle device, favoring an unsealed or no-contract device.

The Android 0.9 SDK beta was released on August 18, 2008. This release provided an updated and extended API. It also improved development tools and provided an updated design for the home screen. The comprehensive directions for upgrading are available to those already working with an earlier release. The Android 1.0 SDK (Release 1) was released on September 23, 2008. According to the release notes, it included predominately bug fixes, even though some smaller features were added. It also included several API changes from the 0.9 version. Numerous versions have been released since it was developed. [2]-[6]

Review of Android SDK

The Android software development kit (SDK) includes a wide-ranging set of development tools [7], a few of which are namely a debugger, libraries, a handset emulator based on QEMU, various documentation, sample code, and tutorials. It currently supports development platforms including computers running Linux (any modern desktop Linux distribution), Mac OS X 10.5.8 or later, and Windows XP or later. One can also develop Android software on Android itself by using the AIDE - Android IDE - Java, C++ app and the Java editor app. Eclipse is the officially supported integrated development environment (IDE) using the Android Development Tools (ADT) Plugin, though IntelliJ IDEA IDE (all editions) fully supports Android development out of the box[8] . Android development is also supported by Net Beans IDE via a plugin [9]. Furthermore, developers may use any text editor to edit Java and XML files. They can then use command line tools (Java Development Kit and Apache Ant are required) for the creation, building and debugging of Android applications as well as control attached Android devices (e.g., triggering a reboot, installing software package(s) remotely) [10].

Enhancements to Android's SDK go hand in hand with the overall Android platform development. Older versions of the Android platform is also supported by the SDK if at all developers wish to target their applications at familiar older devices. The provided development tools are downloadable components, such that after one has downloaded the latest version and platform, for compatibility testing even the older platforms and tools can also be downloaded.

The Android SDK package also includes a toolkit which is the Android Debug Bridge (ADB). It consists of both client and server-side programs that communicate with one another. The command-line interface [11] accesses the ADB, although numerous graphical user interfaces exist to control ADB.

A diagnostic protocol, called Fastboot, included within the SDK package is used primarily to modify the flash file system via a USB connection from host computer. It is required that the device should be started in a boot loader or Second Program Loader mode in which only the most basic hardware initialization is performed. It accepts a specific set of commands sent to it via USB using a command line, after enabling the protocol on the device.

The NDK is based on command-line tools and requires invoking them manually to build, deploy and debug the apps, unlike Java application development, which is based on an IDE. Integration of the NDK into Eclipse [12] and Visual Studio [13] is allowed by several third party tools.

The Android 3.1 platform (also backported to Android 2.3.4) introduced Android Open Accessory support, which allows external USB hardware (an Android USB accessory) to interact with an Android-powered device in a particular "accessory" mode. When an Android-powered device is in accessory mode, the connected accessory performs as the USB host (powers the bus and enumerates devices) and the Android-powered device acts as the USB device. Android USB accessories are notably designed to attach to Android-powered devices and adhere to a simple protocol (Android accessory protocol) that allows them to detect Android-powered devices that support accessory mode. [14

Tools Available for Cross Platform Application Development

Cross platform applications means creating single Application or writing single source code and get it executed on different platforms. While development of mobile Application developer checks for technique which will be best to save money, avoid learning new languages and make Application fit for maximum devices. Due to varying device hardware capability and different Software architecture, it„s a challenge to deploy single code base application on Multiple platforms. Cross platform development tools gives a solution. There exists number of tools available for cross platform development.

1. Appcelerator‟s Titanium
Appcelerator introduced Titanium in 2008, an open source cross platform app development framework.

Advantages:
- Can be used as standalone software or in integration with tools like PhoneGap.
- Uses Alloy framework where interfaces are designed using XML and CSS.

Disadvantages:
- Additional cost is required for extra analytical capabilities and cloud services.

2. Corona SDK
Corona SDK uses a scripting language called Lua that could integrate spite sheets, and social media into the app.

Advantages:
-It is a faster application developer as opposed to traditional methods.
-Can design cross-browser applications, games and e-books.

Disadvantages:
- Starter is the only free structure offered by Corona, which doesn„t consist of as many features as Pro, which is the paid one.

3. Qt
Qt Creator is an IDE provided by the cross platform development framework Qt.

Advantages:
-It provides services for iOS and Android as well as desktop operating systems.
-Reuse of code is plausible.

Disadvantages:
- Size of app could be too large due to large Qt libraries.

4. Sencha Touch
It is an HTML5 mobile application framework.

Advantages:
- Can be implemented in a hybrid shell or within a browser
- Works on webkit based on browsers in iOS, Android and tablets.

Disadvantages:
- Not designed for desktop internet applications at all.
- Works slower compared to native apps.
- Has trouble in accessing hardware of device.

5.Xamarin
It is designed to be a single code bas accrues different mobile platforms without compromising quality or performance.

Advantages:
- Its eases development by facilitating features from creation to publication that is inclusive of interface, debugging, testing and deployment of project.
- Primarily uses C# and .Net libraries and also allows Visual Studio.

Disadvantages:
- It does not allow the creation of reusable components outside its own environment.
- UI development is not portable between platforms.

6.PhoneGap

Nitobi introduced PhoneGap, an application development framework which allows developer to create applications across multiple platforms. This work was further contributed to the Apache Software Foundation and named as Callback and later changed to Cordova.

Advantages:
- Supports all major platforms as well as APIs
- Based on newest technologies such as HTML5, CSS3 and javascript. Thereby it does not need dense programming language.

Disadvantages:
- To create an app more than once, a fee is required to be paid on a monthly basis.
- Cannot be efficient when working for native apps.
- Does not support all the functionalities.

Advantages of Android Studio
- Gradle Build system deep integration
- ADT Feature parity
- Dual monitor support
- Build Variants - Quickly switch between different product versions.

Disadvantages of Android Studio:
- It's an "early access" right now, so it's buggy.
- It doesn't offer any features currently that IntelliJ's build-in Android support doesn't have.

For this application to be developed the best choice is Android Studio owing to its above cited advantages which are in favour of the application to be developed.

Sr. No.	Tools	Programming Language Used	License	Device capability Support	Integrated Development Environment support and build environment	Cross platform development on
1	Apache Cordova/ PhoneGap	HTML, CSS, JavaScript	Apache 2	Geolocation, Files, Network, Accelerometer, Notifications, Camera, Contacts, Compass, Storage and media	Any SDK can be used just PhoneGap plugins need to be installed.	iPhone, Android, Tizen, Windows Phone, BlackBerry, Symbian, Palm, Bada
2	Sencha Touch	HTML, CSS, JavaScript	GPLv3, Free Commercial License, Paid OEM and Embedded Systems Licenses	-	Sencha Architect 2	iOS (iPhone, iPad, iPod touch), Android, Kindle, BlackBerry, Bada

3	Qt	C++, QML	Free & commercial licenses available	Commercial license, GPL v3 and LGPL v2	-	Qt Creater
4	Xmarin	C#	Open Source license- LGPLv2 license	-	Xamarin Studio or Visual Studio	iOS, Android and Windows
5	Corona SDK	Lua	Free unlimited trial; commercial licenses available for deployment	camera, accelerometer, gps	Xcode	iOS, Android, NOOA Color
6	Titanium Appcelerator	JavaScript, HTML, CSS, AJAX, jQuery	Open Sourced Apache 2.0 licensed, commercial and enterprise licenses available	Vibration, Geolocation & Mapping, Accelerometer, Sound, Photo Gallery, Orientation, Camera, Screenshot, Shake, Record Video Proximity Events, Push Notifications	Titanium Studio based on Eclipse, Titanium SDK	Android, iPhone; BlackBerry, Tizen, mobile web

III.   CONCLUSION

The ultimate vision of this application is to be a one stop platform built upon the growing and vital need for fitness, which will enable fitness domain businesses to operate seamlessly and on the other end allow fitness consumers to connect and work out on their fitness levels, with these businesses.

This project strives at maintaining minimal shortcomings by enabling all fundamental features available to all associated clients of the fitness centre, i.e. user, trainer and admin. The project approaches the entire application by designing each module at a time. This application layer then acts as the medium between the user and the database, and on appropriate interaction between all significant models, it enhances the entire process of the fitness centre experience.

Though this application tries to offer all essential facilities required at a fitness centre, it doesn"t guarantee the user"s efficient use of the product. For instance, alerts sent to the user"s phone may be ignored.

ACKNOWLEDGMENT

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Key Establishment using Selective Repeat Automatic Repeat Request Mechanism for Wireless Sensor Networks

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ABSTRACT:

In Key pre-distribution techniques for security provision of Wireless Sensor Networks, a diminutive number of keys are randomly chosen from a large key pool and loaded on the sensors prior to deployment such that they have a common key. Secret keys generated are then placed in sensor nodes, and each sensor node ransacks the area in its communication range to find another node to communicate. A secure link is established when two nodes discover one or more common keys, and communication is done on that link between those two nodes. Few neighboring sensors do not share any common key. To establish secure link in such networks, a secret key is exchanged via a multi-hop secure path. But sensors may be compromised on the path rendering process insecure. This paper sets forth a research plan for an enhanced Modified Incremental Redundancy Transmission scheme that uses Selective Repeat Automatic Repeat Request mechanism to address the problem. Through multiple multi-hop paths, the information is transmitted. Only when the destination fails to decode the information, erroneous frame are transmitted to reduce the transmission overhead.

INDEX TERMS—Wireless sensor networks, key predistribution, randomness, selective repeat

I. INTRODUCTION

The Wireless sensor network (WSN) is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting. A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor nodes is similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Secret key establishment is a fundamental requirement for private communication between two entities. Currently, the most common method for establishing a secret key is by using public key cryptography. However, public key cryptography consumes significant amount of computing resources and power which might not be available in certain scenarios. A less expensive and more flexible solution to the problem of sharing secret keys between wireless nodes is to use the inherent randomness in the wireless channel between them as the source for extracting bits of the secret key between these nodes.

Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. The propagation technique between the hops of the network can be routing or flooding.
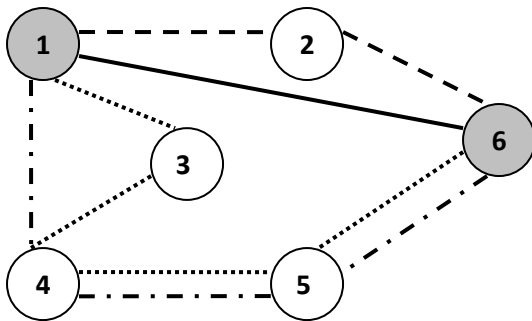
II.   PROBLEM FORMULATION

Figure 1: Illustration of path establishment

The key pre-distribution schemes such as [1],[2] and [3] provide memory-efficient and resilient ways of establishing common keys for information transmission for a fraction of potential communication links. The rest of the communication links need to establish their common keys between each pair of nodes by other means such as multihop delivery.

A network topology with few sensor nodes is shown in Figure 1. Each line segment connecting two nodes represents that these two nodes share at least a common key. For example, nodes 1 and 4 share at least a key. Note that nodes 3 and 6 do not share any common key. Now, assume that nodes 1 and 6, as source and destination respectively. They need to establish a secure communication that requires a common key between each pair of nodes in the path established. As suggested in [1],[2] and [3], in order to establish a path with common keys between each pair of nodes between the nodes 1 and 6, a multihop secure path may be used to deliver the message.

The nodes first perform key-discovery to find out with which of their neighbors they share a key. The shared key then becomes the key for that link. After key-setup phase is completed, a connected graph of secure links is formed. If the graph is connected, a path can be found from a source node to its neighbor. For example, we assume nodes 1 and 6 do not share any common keys and therefore the message cannot be transmitted through that path. Node 2 may be used to relay the message between nodes 1 and 6. Since only one multihop path is used, we term it as Single-Path(SP) scheme. Some examples of multihop paths in Figure 1 are 1-6, 1-2-6, 1-4-5-6, 1-3-4-5-6. The dotted line denotes the various paths from the source to the destination node.In general, random key pre-distribution schemes may experience some communication links being exposed when some sensors are compromised. A compromised sensor may modify or drop the secret information passing through the multihop path. This leads to the following problem:

Problem Statement: In key pre-distribution schemes for WSNs, some neighboring sensors do not share any common key. To establish secure link in such networks, multi-hop secure paths are used. However, when any of the sensors on the multi-hop secure path is compromised or captured by the adversary, the part of the information is disclosed. A compromised sensor may also modify or drop the key information passing through itself. What fault-tolerant mechanism should we use to send the information between two physical neighbors efficiently and securely? Note that we work on the problem of sending information between two neighbors that do not share a common key after the key pre-distribution process.

III.   BASIC SCHEMES AND MATHEMATICAL MODELS

Key pre-distribution is the method of distribution of keys into nodes before deployment. The network is formed using the secret keys deployed to each node. Key pre-distribution techniques for security provision of Wireless Sensor Networks (WSNs) have attracted significant interests recently.

A key pre-distribution scheme has 3 phases: Key pre-distribution, Shared key discovery, Path-key establishment. In these schemes, a relatively small number of keys are randomly chosen from a large key pool and loaded on the sensors prior to deployment. After being deployed, each sensor tries to find a common key shared by itself and each of its neighbors [1].

Due to the randomness of the key selection process in key pre-distribution, few communication links do not have any common key shared by the two neighboring nodes. Hence a secret link key delivery technique using a multi-hop secure path was proposed: one of the two neighboring nodes finds a multi-hop secure path towards the other node. Each pair of neighboring nodes on the secure path shares at least a common key, which could be different throughout the path.

Such a multi-hop secure path scheme works quite well when all sensor nodes forward the secret key honestly and none of the nodes on the path is compromised. However, the scheme has security problems if any of the nodes is compromised. Such a compromise affects the multi-hop secure path scheme.

In random key pre-distribution, a network need not be fully connected for effective communication to take place. Therefore this technique ensures good connectivity in the network at the same time requires lesser memory space. The EG and Hexagon based deployment model schemes follow random key pre-distribution. [2].

EG Scheme: Eschenauer and Gligor proposed a random key pre-distribution scheme,which is also referred as basic scheme. Let m denote the number of distinct cryptographic keys that can be stored on a node. The basic scheme works as follows. In the initialisation phase a keypool is picked from the key space. Then a set of m key rings are assigned to each node. In the next phase , after the nodes are deployed , the nodes look for shared keys among them and then a link is established upon the discovery of common keys.

Eschenauer and Gligor calculate the necessary expected node degree d in terms of the size of the network n as:

$$d = \left(\frac{n-1}{n}\right)(\ln(n) - \ln(-\ln(c))) \quad (2.1)$$

For a given density of network deployment, let n be the expected number of neighbors within communication range of a node. Since the expected node degree must be atleast as calculated, the required probability p of successfully performing key-setup with some neighbor is:

$$p = \frac{d}{n'} \quad\quad (2.2)$$

Improving Key predistribution Using Hexagon Based Deployment Model: The centre of a grid is a deployment point, which is the desired location of a group of nodes. The location of node over the entire node field follows some distribution with a probability density function. In hexagon-based scheme, all adjacent sensor nodes have the same distance.

In the hexagon system, first, when a node transmits data over wireless links, its signal range would form a circle that is centered around its deployment location with the radius being the distance of signal propagation. Therefore, a hexagon can be used to express and simulate the signal range more approximately. Second, a hexagon can be used to describe equal distance between two neighboring nodes. Under the hexagonal coordinate system, all adjacent sensor nodes have the same distance which is normally 1 unit.

If the number of nodes is too large, we may divide them into groups and deploy one group each time. Each group of nodes may be deployed into a local area or to just a single deployment point, which is the desired location of nodes. In a group-based deployment model, there are two generally used distributions: In most cases, nodes are often assumed to be uniformly deployed i.e. Uniform distribution. The actual model for the deployment distribution depends on the deployment method.

In the hexagon-based scheme, each nodes center is its deployment hexagon. It shares keys with the nodes deployed in its 19 adjacent hexagons. In Figure.2 all nodes deployed in shaded hexagon can share key with the sensor nodes deployed in hexagon 5. The hexagon based pre-distribution scheme has three phases.
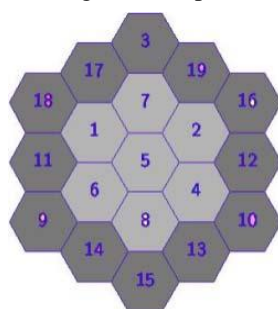

Figure 2: Hexagon co-ordinate system

Proposed scheme: Typically, data transmission is not strictly delay-sensitive but requires a virtually error-free link. To provide reliability over wireless channels, in this work we analyze the modified Incremental Redundancy Transmission scheme,i.e., IRT scheme based on the Selective Repeat protocol allowing transmission of packets without waiting for acknowledgement. In this ARQ, the sender and receiver window size must be equal, and half the maximum sequence number to avoid miscommunication.

Selective Repeat ARQ protocol may be used as a protocol for the delivery and acknowledgement of message units, or it may be used as a protocol for the delivery of subdivided message sub-units.

In this work, we propose a key pre-distribution scheme which improves the resilience of the network with decrease in the fraction of nodes compromised compared to previous schemes and supports flexibility in terms of connectivity. The proposed scheme also enhances the average rate of successful message delivery over a communication channel.

Initially, after the deployment of keys to each node the network is formed. Path is established from the source to the destination between nodes with common keys and the corresponding hop count of each path is obtained.

When Selective Repeat ARQ is used as a protocol for the delivery of messages, even after a frame loss, the sender continues to send frames specified by a window size. Unlike Go-Back-N ARQ, the receiver will continue to accept and acknowledge frames sent after an initial error.

The receiver keeps track of the sequence number of the last frame it has not received. Even if the receiver does not receive a frame, the ender keeps sending subsequent frames until it has sent all the frames in the window. The receiver accepts the subsequent frames and replies with an acknowledgement containing the sequence number of the last missing frame. After all the frames in the window are sent, the sender re-sends the frame number given by the ACKs, and then proceeds where it left off.

Selective Repeat ARQ is used as a protocol for delivery of subdivided messages, where messages are variable in length. For this selective retransmission may be employed in conjunction with the basic ARQ mechanism.

The original variable length message is a concatenation of a variable number of sub-blocks. The message is first subdivided into sub-blocks based on hop count of the established paths, in a process called packet segmentation. The number of frames transmitted is based on the window size. In ARQ with selective transmission the negatively acknowledged response would carry a bit flag indicating the identity of each sub-block successfully received. If the received frame is erroneous, it is rejected and selectively re-transmitted. When frame is received successfully it is acknowledged. Selective re-transmission applied to variable length messages completely eliminates the difficulty in delivering longer messages, as successfully received sub-blocks are retained after each transmission and outstanding sub-blocks in following transmissions diminishes.

IV. PERFORMANCE EVALUATION

Simulations have been performed in Matlab to evaluate the efficiency of the proposed scheme. We investigate the performance of the modified IRT scheme and other related schemes. These schemes include the Incremental Redundancy Transmission scheme, the SP scheme, Hexagonal based deployment model scheme and the random key pre-distribution scheme.
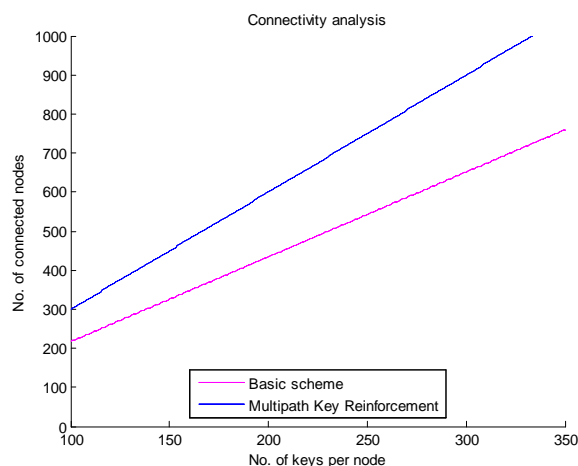
Path Availabilities: In Figure 3, we show the number of paths with secure connections that are exactly h hops from a source to a destination (assuming that they do not share a common key). The average number of paths is presented, corresponding to various local connectivity. We also present the number of paths for a similar network with half the nodes for comparison purposes. As shown in Figure 3, the number of available paths increases with the local connectivity. When the node density increases, there are more paths as well. The number of h-hop paths also increases with h. Note that these paths may have common nodes other than the source and the destination.

Transmission Overhead: When there are compromised nodes on the paths used to deliver the information and these compromised nodes modify the passing information, extra symbols need to be transmitted. The SP scheme randomly chooses one out of the available paths to send the information.

The sender sends a number of frames specified by a window size even without the need to wait for individual ACK from the receiver. The receiver accepts out-of-order frames and buffers them. The sender individually retransmits frames that have timed out and erroneous frames. To reduce the total information that needs to be transmitted, the redundant symbols are transmitted only if the destination fails to decode the information successfully. Therefore reducing the transmission overhead and increasing the performance efficiency.

Security Analysis: The fraction of total keys being compromised can be expressed as,

$$p = 1 - \left(1 - \frac{m}{|s|}\right)^x \qquad 4.1$$

The equation 4.1 implies smaller the value of m, better the resilience. |s| is the size of the key pool.

The security analysis of the Basic scheme is calculated with memory as 3 and the key pool size as 900. As the number of nodes increases in the network, it is more probable that number of nodes being compromised also increases. Therefore, the resilience of the network increases with the decrease in the fraction of the nodes compromised.
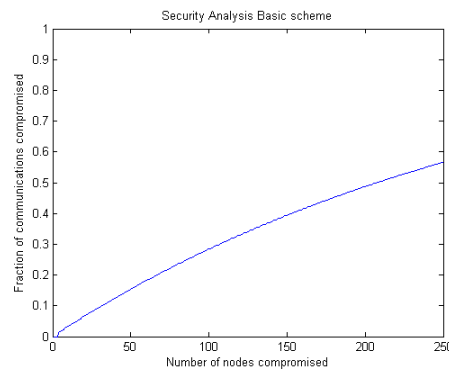
Figure 4: Security Analysis of Basic Scheme
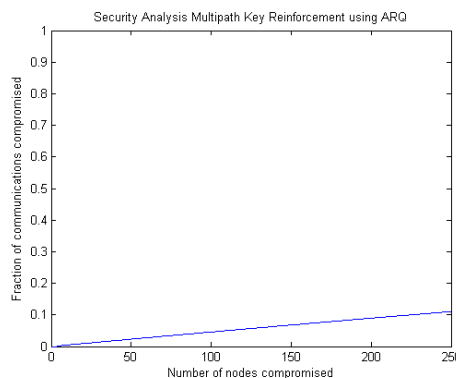
Figure 5: Security Analysis of Multipath Key Reinforcement
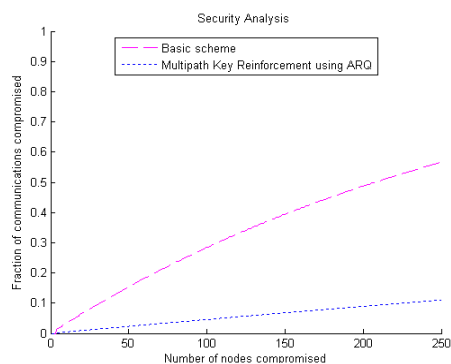
Figure 6: Security analysis comparisons

Figure 6 shows the comparison of security analysis of the basic scheme and multipath key reinforcement with memory as 3 and the key pool size as 1600. It is inferred that the resilience has increased as the number of nodes being compromised has decreased; eventually the security of the network also increases. The security of the Multipath Key Reinforcement is better than that of the Basic scheme.

From the results we infer that, the basic scheme is vulnerable to security threats leading to poor resilience. Whereas in the proposed scheme, the security is enhanced.

V.   CONCLUSIONS

We have proposed and investigated a modified Incremental Redundancy Transmission (IRT) scheme for the secret common key establishment process of key pre-distribution techniques. The modified IRT scheme uses Selective Repeat ARQ mechanism to send the information through multiple multi-hop paths. An important feature of the IRT scheme is the flexibility of trading transmission for lower information disclosure. From the analysis, it can be inferred that multipath key reinforcement has proved to be a more tangible solution than the basic scheme in terms of resilience against node capture.

From the results and graphs it is inferred that the path availability is improved in the network, transmission overhead is reduced and security is enhanced in the proposed scheme.

In the future work we will consider transmission between multiple sources and multiple destinations and the effect of node disjoint paths will be investigated as well.

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Non-Invasive Blood Glucose Measurement

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ABSTRACT:

The method for noninvasively blood glucose monitoring system is discussed in this paper. Lot of research work has been done in developing the device which is completely non-invasive to avoid the pros & cons because of frequent pricking. In this paper we are trying to analyse the non-invasive blood glucose measurement study in the near infrared region which is the most suitable region for blood glucose measurement. For this purpose we use a technique which is similar to pulse oximetry based on near infrared spectrometry .An infrared light of particular wavelength is passed through fingertip containing an arterial pulse component Thus minimizing influences of basal components such as resting blood volume,skin, muscle and bone.

Keywords- *Glucose measurement, Non-invasive, Photoplethysmography (PPG), Pulse-oximetry, Infrared, Optical, Diabetes*

I. INTRODUCTION

Diabetes mellitus is a medical condition in which the body does not adequately produce the quantity or the quality of insulin needed to maintain the normal circulating blood glucose. Insulin is the hormone that enables glucose (Sugar) to enter the body cells to be used for energy. Two types of diabetes are common. Type I is known as Insulin dependent diabetes Mellitus (IDDM) & accounts for 5-10% of all cases. Type II or Non-insulin Dependent Diabetes Mellitus (NIDDM) requires insulin doses to maintain life, In addition to healthy eating & exercise. NIDDM occurs later in life perhaps after 40 years of age and may require insulin or to be controlled with an oral medication weight loss, a nutritious diet and a regular exercise.

Blood glucose measurements allow the detection of diabetic condition and are widely used by hospitals like Operation Theatre, ICU, ER and Labour Room. [1]

A non-invasive blood glucose measurement has many advantages including the prevention of pain and potential transmission of infectious diseases, reduced need for trained personnel, and relatively short measurement time, and the absence of bio-hazardous waste. Since the near infrared light is found to penetrate a great depth into biological tissues, near infrared spectroscopy has been used in development of non-invasive method for biomedical sensing and clinical diagnosis. The absorption of whole blood in the visible and infrared range is dominated by the different glucose derivatives and blood plasma that consists mainly of water. It is well known that pulsatile changes of blood volume in tissue can be observed by measuring the transmission or reflection of light through the blood volume.

Several methods are used to measure total blood glucose. The most common methods utilize spectrophotometric analysis of light absorbance based on Beer –Lambert law.[2]

1. Methods for Glucose Measurement

1.1 Invasive Methods

Laboratory methods used for blood glucose testing
A) Reduction method
B) Condensation method
C) Enzymatic methods

1.2 Non Invasive Blood Glucose Measurement Techniques

Noninvasive methods mostly depend on absorption or transmittance. Blood glucose gives different absorption spectrum for different wavelengths.

1.2.1   Optimal wavelength region in the near infrared [5]

The MIR light propagates only into a few scores or micrometer and may be applied for extracted blood sample. On the other hand, the NIR light has deeper penetration into biological medium up to a few milimeters. The NIR has a potential to be applied for non-invasive or minimally invasive blood analysis even though glucose absorption is not as high as in the MIR region Following are the most common noninvasive methods.

1.2.2   Near infrared spectroscopy:

Glucose produces one of the weakest NIR absorption signal per concentration unit of the body major component.NIR spectroscopy glucose measurement enables investigation of tissues depths in the range of 1 to 100 millimetres with a general decrease in penetration depth as wavelength value is increased.NIR transmission through an earlobe, web and finger cuticle or reflected from the skin.

1.2.3   FIR spectroscopy:

A second technology for non-invasive blood glucose monitoring through spectroscope measures absorption of FIR contained in natural thermal monitoring through spectroscope measures absorption of FIR contained in natural thermal emission or body heat. FIR spectroscopy is the only type of radiation technology that does not require an external energy source.

1.2.4   Raman spectroscopy:

Raman spectroscopy measures scattered light that has been influenced by the oscillation and rotation of the scatter. Various Raman techniques have been attempted in blood, water, serum and plasma solutions. Analytical problems include instability in the laser wavelengths and intensity & errors due to other chemicals in the tissue sample and long spectral acquisition times [3]

1.2.5   Photo acoustic spectroscopy:

It uses optical beam to rapidly heat the sample and generate an acoustic pressure wave that can be measured by microphone. The techniques are also subject to chemical interference from biological molecules as well as physical interference from temperature and pressure changes. [4]

II.   BASIC PRINCIPLE

Basic block diagram of noninvasive blood glucose measurement system is described in following figure.The non-invasive sensor system allows a continuous measurement of the blood glucose concentration, which is based on a pulse photometric measurement method. Thereby an area of skin is trans-illuminated by light which is emitted by LEDs in the range SW NIR. Suitable wavelengths are selected for the analyses of relative blood glucose concentration.

a.   Mathematical implantation

Blood glucose is responsible for providing the energy to body. For spectrophotometric experiments, Beer-lambert's law is utilized and developed the notation of absorbance to express light absorption as a function of blood glucose concentration given by following equation (1).

$$OD = \log_{10} \frac{I_0}{I} = \epsilon \times C \times L \qquad (1)$$

Where OD-Optical density
I_0-Light intensity of incident light
I-Light intensity of transmitted light
ε-Extinction coefficient
C-Concentration of blood glucose
L-Length of light path through solution

b.   Sensor Design

The developed glucose sensor system consist of number of hardware modules, which consist of appropriate light sources, constant intensity circuit, detector circuit. The sensor consist of emitter LED's with center wavelength of simple RED light and 940nm.and 1450nm.comparative study for all wavelength is performed on a specially designed hardware ckt each wavelength shows different kind of behaviour when readings are taken with known concentration of glucose exposed to diff wavelengths. The LEDS are designed to be placed opposite to a photo diode that detects the light from the LEDS. Absorption on each wavelength differs significantly for different glucose concentration

Detector ckt is common for all wavelengths and it is shown below:
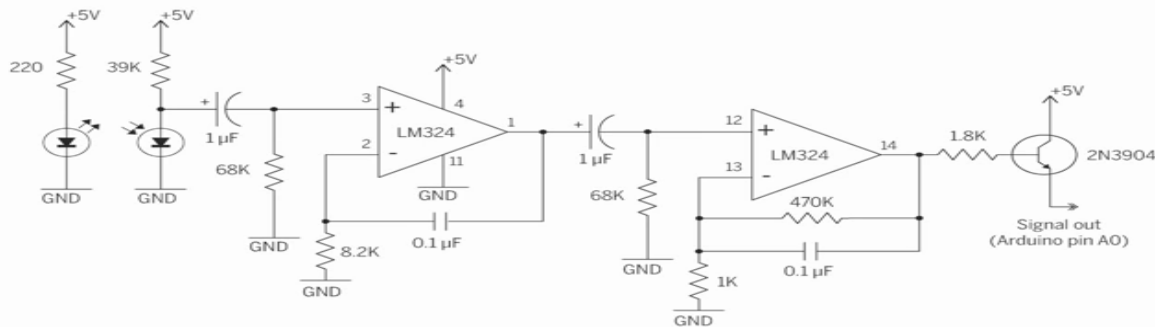
Relationship with glucose concentration when experimentation is carried out with different glucose concentration made from distilled water and sugar.
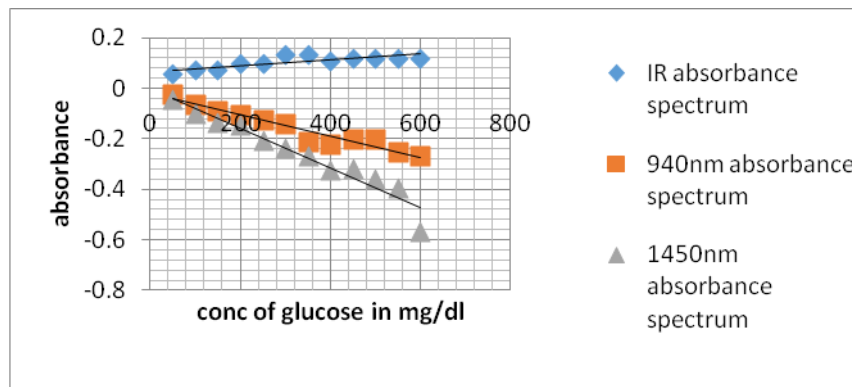
This single receiver photo diode is installed in the lower shell of finger clip. The probe is placed to the patient's body usually on the finger. The transmitted light is sensed by photodiode. Output voltage of photodiode varies linearly with intensity.

III.   RESULT AND DISCUSSIONS

An optical sensor is developed for blood glucose using wavelength of simple IR, 940nm and 1450nm. Output is obtained on Digital storage oscilloscope Correlation is established between actual blood glucose concentration and measured output voltage. Curve is fitted in fig. 1 and correlation is obtained From results it is observed that 940nm and simple IR is giving the linear relationship .but 1450nm wavelength can be used for non-invasive measurement since it has linear relationship with glucose concentration provided other error causing elements are reduced. Still there is a scope for further development. A sensor developed with very high signal to noise ratio can be designed and more no of readings taken would be an added advantage for future scope of research in this field.

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E-University Environment Based on E-management

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ABSTRACT:

The management of resources and processes using communication networks may call e-management. This work presented an e-management approach at the university environment. This approach including, the control off all flow of data (incoming and out coming) in addition of data protection in which data are separated in different sits. A check list questionnaire is implemented for data collection from different levels of staff at the computer sciences faculty of the indicated University. The obtained results indicated that (50.75 %) of the tested sample are accepted the new environment of management and the other percentage (49.25 %) is not satisfy with this environment for many reasons such as lack in the use of computer, lack of familiarity with the internet, the culture of the community is limited on the use of e-management and there is lack of potential in providing the infrastructure require for the project of e-management.

KEYWORDS: *E-management-university-administration, E-learning and E-government.*

I. INTRODUCTION

Management involves identifying the mission, objective, procedures, rules and the manipulation of the human capital of an enterprise to contribute to the success of the enterprise. E-System is one of the mutations the science and technology. The electronic administration and management concentrated on the branches of the E-systems, in additional to this development is the availability of computers and provides Internet are integrated these factors to help the prosperity of the E-administration and E-management-Administration is '*the effective management of the coordination and control of business processes and the electronic information they create*'. This definition has two main objectives: first increase the efficiency of administrative processes within institutions and second lessen the administrative burden faced by all staff during this process. Ambitions to develop and implement electronic administration have a positive effect on the reality of the administration of the conventional speed, accuracy and maintain databases of damage, fire, theft or tampering. E-administration is used computers and the Internet, Uses the Internet to support communication between the administration and citizens in general and students in the university in particular. Will be discussed in our reflection on this electronic administration at the university, as well as how to maintain the confidentiality of information stored and protected from the unauthorized access through the application of a new mechanism to maintain the integrity of the information or the application of a mechanism exists and is applied in other database. Will be the work of a questionnaire to various segments of the layers of the university to identify extent of their emphasis to the application of administration, at the same time to identify their culture about their awareness of the concept of the new electronic administration, the possibility of their application within what is available from the staff or infrastructure required for the success of the new administration and disposal of the old constraints [1,2].

II. E- MANAGEMENT

Nowadays electronic management or online management introduced in real applications in the developed countries, but in addition developing countries and those countries in the transition period to the market economy begin to apply this concept [3].

Consists of two words a sentence management and electronics, management deals with the art of fulfilling the tasks of the manpower working in the organization (university) to reach the desired goals to the student and staff, and the main operational functions are planning, organization, control, and decision-making. Also known as the organization of tasks within the limits of available resources, monitoring and directing staff to complete in order to achieve the goals set to the university.

Electronics is the branch of science, engineering and technology that deals with electronic circuits involving active electronic components such as vacuum tubes, all types of transistors, all types of diodes and circuits. Furthermore is simply the transition from completion of the transactions and delivery of public services from the traditional method of manual to electronic format for optimal use of time and money and effort. In other words, and "Electronic administration" is the completion of administrative transactions and delivery of public services via the intranet without requiring the student to move to the university to complete their transactions with the associated waste of time and effort and energies. E-management is based on the concept of a new and sophisticated than the modern concept of "contact and do not travel or come" and conveyed a step forward so that the "enter on the site and do not fall in site of the university [4].

According to the definition of e-management, the conceptual model is shown in figure (1). Conceptual model of E-management is included of three phases: input phase, transforming phase and output phase. In each phase, the electronic technology, communication technology, information technology and network technology are required to implement it. In the input phase, electronic technology is introduced and it is the original part of the whole model. The transforming phase involves electronic source, electronic speed and electronic service. The last phase is the output phase which refers to the electronic organization; here, it is equal to the electronic enterprise. The electronic management using technology is used to improve and facilitate the governing process besides maintaining electronic records for the best performance and results of the work flow integration of information [5,6].
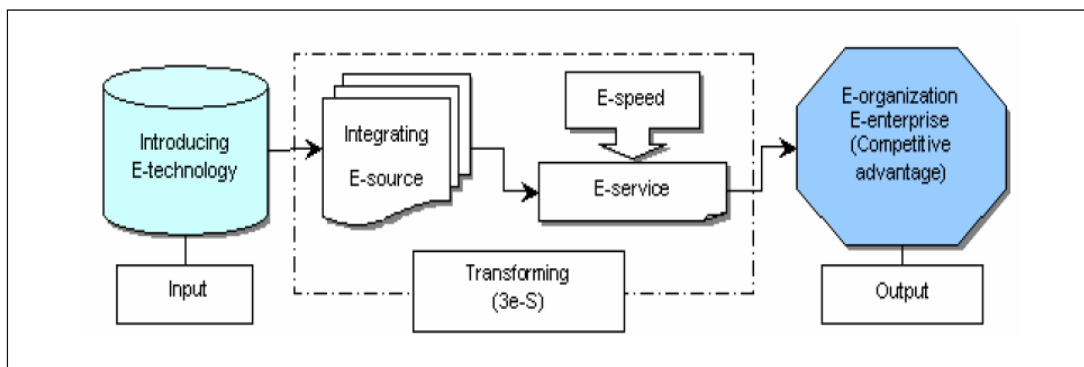
Figure (1) E-management conceptual model

III. DIMENSIONS OF ELECTRONIC MANAGEMENT

There are many dimensions related to e-management as shown in figure (2) and mentioned below [7]:

- Management Paperless; as it depends on the electronic archive and e-mail, manuals and notebooks and electronic voice messaging systems and applications, follow-up mechanism.
- Remote management; as they rely on electronic communication, and other modern means of communication.
- Real-time management; where she works 24 hours straight.
- Event Management rigid regulations; as they work through institutions based on the knowledge industry.
- Management anytime, anywhere; lastly it can be added that you can manage and monitor your organization anytime, anywhere.
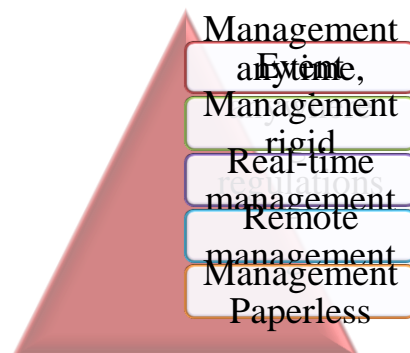
Figure (2) E-management dimensions

IV. RELATED WORKS

Recent noticeable studies in personal identification based on the E- management, below some at these researches:

Matei et al. developed concept soft public sector reform, and explored it within the boundaries of electronic administration practices. International competition and internal raising expectations have push governments across the world to reordering their relationships with the surrounding environments. In this case, they mostly switched to a newer paradigm, based not on affirmation and mechanical theories, but on the concept of a living, biological system [8].

Hossein Rahman et al. applied their approach using two approaches: descriptive method and survey method. This paper demonstrated that among 25 factors, classified in 6 main factors: managerial, cultural-social, humanistic, technical-technological organizational structural and environmental factors. The main factors that are preventing the implementation of E-management in Iran are cultural, environmental and organizational factors [9].

Francisco J. López Carmona concerned that electronic administration is a main component of the citizen service strategies within public administrations. The City Council of Madrid proposed a multichannel approach that employs the elements of electronic administration, drawing together the various services and ensuring coherence in the services provided whilst attempting in order to guarantee the highest levels of accessibility to all people irrespective of their background [10].

Antonio Muñoz- Cañavate et al .proposed the basic lines of electronic administration applied in Spain. They discovered that complexity of the Spanish political-administrative system makes such a study challenging, in view of the considerable degree of autonomy and competence soft regional administrative bodies and local agencies with respect to the central government. The former result being more visible in the17 regions of Spain. A series of legal instruments are maintained by the central government that allows a certain common framework of action to be imposed. The diverse programs aimed directly to develop common main tools for the regions and municipalities in Spain. This study described the legislative framework in which Spain's electronic administrative system has developed [11].

AmelAttour-Oueslati et al. contributed to the knowledge on the various issues raised by local electronic administration and proposed an analytical framework for the evaluation of the potential local online service offerings. Examination of how local public administration has developed in France is based on evidence from a dedicated survey of a sample of French communes. The analysis will enable us to identify the relative effort and performance in the development of local electronic administration based on the particular socio-economic characteristics of the communes [12].

V. OBJECTIVES OF E-MANAGEMENT

There are many great benefits and applications of electronic management at the university environment:
- Build a state of art management environment.
- Integrates digital teaching, researching, and living.
- Expedite the information flow.
- Find a strategic move to an e-campus.
- Find a simplified method of working.

In additional- management has many benefits, including:
- To simplify procedures and reduce the cost and give more quality of service. Shorten the time of the completion of management transactions.
- Accuracy and objectivity in the operations performed.
- Facilitate communication between the student and with the university inside and outside the country.
- Reduce use of paper, which is significantly positive impact on the university's work.
- Continuous monitoring and tracking inside and outside the organization.

VI. E-MANAGEMENT PROPOSED MODEL

E-management governance is one of the important concepts in the present era and the structure of transition to e-management includes many stages as shown in figure (3). At these stages, after the lifting of data via the official website of the University, will store the data in two different positions, one will be available to the users (teachers &students), but the other part of the data will be hidden In which the system after different

periods depending on the system design compare the data and discover of difference between the original data available at the university and the data on the site of the university.

The mean difference is obtained after verifying the identity of the visitor to the electronic management system, where each person requesting his information. It is important to make sure of the identity of the user or person according to the mechanism applied at the system. For example, every person should know that there is a question randomly asked then he/she must have the ability to answer. On the other hand the program will be closed and it will not be allowed to enter again until you obtain a license from the director of system.The bottom of the figure shows that the model used in data protection and identity of the applicant to make sure the information or documents.
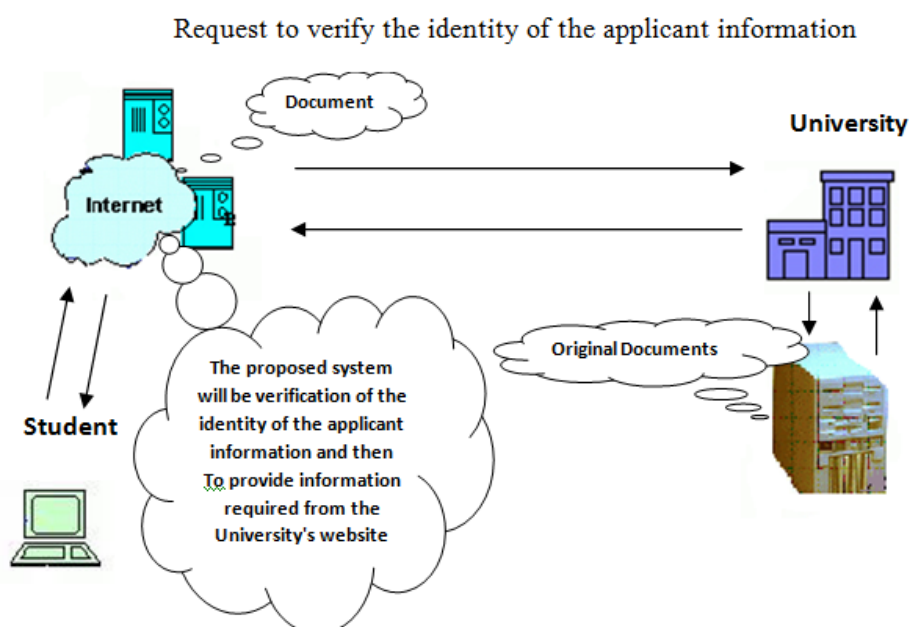
Figure (3) the structure of proposed e-management model

VII.   RESULTS AND ANALYSIS

All know that there are many restrictions in applying electronic environment in Arab countries comparing that with the developed countries. Electronic management in the university is an important issue in education, training and development. A proposed model is implemented to protect the privacy of data and documents and to facilitate all flow of data in the environment. Then we have conducted questionnaire check list to a different layers in order to evaluate the response.

The questionnaire involves a simple description of our proposal, motivation, and the expected consequences. Then, we have selected four groups of management staff. The questionnaire also includes some guidance questions and it is separated into three levels as shown in figure (4) and denoted bellow:

Level one (general computer usage): This level of questions are concentrated of the usage of computer and computer programs.

Level two (Internet usage): This level of questions is concentrated of the usage of Internet and e-mail.

Level three (management concepts): This level of questions is concentrated of the traditional management and e-management concepts.
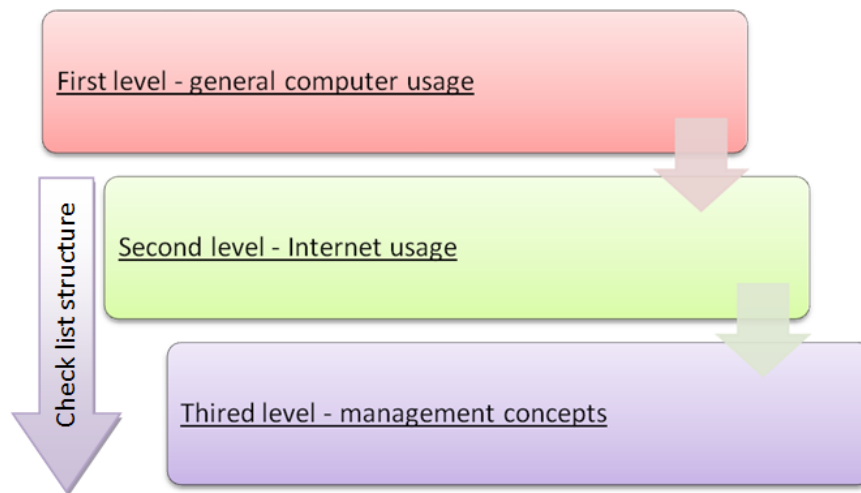
Figure (4) check list structure

The data are collected from 20 members of the group related to the management sectors. These members are selected to be the test sample of our project. Two out of 20 check lists are not true so the total accepted check lists are 18 members. The results examined the tested sample in conclusion of their agreement of our proposal or not.

The most important results of this questionnaire are shown in Table (1). From this table, we can notice that the ratio of support from the management specialized in the field of electronic management is (50.75 %). This can be used as an indicator for the acceptability of the proposal to move the wheel of electronic management forward in our university and society. It is clear that our society is very complex to accept e-environment and the obtained results are acceptable.

Table (1) the Questionnaire Results

Administrative Officer	Director	Head of Department	Dean
% Accept	%Accept	% Accept	% Accept
39 %	63 %	48 %	53 %

The results obtained from the questionnaire check list indicated that the traditional management environment is receipt e-management at the present time for many reasons. we can mention that part in which were discovered during the survey: ignorance of the work of many management during the introduction of computers, weaknesses in the usage of the Internet, the lack of the infrastructure for the establishment of electronic management, many unaware of the subject department electronic and much more by the listener, the other part of the work cannot programs through the management computer and the Internet.

VIII.   CONCLUSION

The Internet is one of the most important discoveries that allows fast communication between organizations and make the world as a small village. The electronic management is the most important applications of information technology .Therefore this project should support the electronic management although there are many obstacles that find the application of electronic management, but this could justify staying on the traditional management. Implementing the e-Management brings changes within the universities, predominantly within their culture.
Interested in network management is essential in providing services via the World Wide Web (Internet) as the key in the exchange of information and communication, and provide solutions, consults and document in the best of the management mechanisms. The obtained result indicates a good initial step for the application of electronic management. An important issue is to understand the concepts of e-environment including e-management and also it is important to concentrate on the benefits and feasibility of the great that will be get via the application of this environment. The obtained results indicated that 50.75 % of the tested sample is accepted e-environment of management which is an acceptable ratio.

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Accident Avoidance and Privacy-Preserving in V2R Communication using Chord Algorithm

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ABSTRACT

Road accidents are the main issue and it creates a huge loss. So it's the challenging one in VANET in real time applications [20]. Here Vehicular Ad-Hoc Networks (VANETs) uses moving cars as nodes and acts as a wireless router in a network [11, 19]. It can communicate by using either V2V (vehicle-to-vehicle) or V2R (vehicle-to-roadside). The problem faced in vehicle-to-vehicle communication cannot lead to malicious attacks and it's tough in computing real time road conditions. By overcoming this problem vehicle-to-roadside infrastructure is used [14, 18]. Our aim in this paper is to improve security, traffic throughput and reduces the traffic delay in a highly congested area [15, 16]. In this paper network checks each vehicle speed for avoid accident based on predecessor and successor vehicle's speed using chord algorithm. We also implementing priority based vehicle movement. Network gives high priority for emergency vehicles and medium priority for registered vehicles and low priority for unregistered vehicles [17]. By this we analyze the performance of priority based vehicle movement and verification of vehicle speed using chord algorithm in network simulator-2.

Keywords:-VANET, GPS, Routing Protocols, V2R, Chord Algorithm.

I. INTRODUCTION

The existing work to find a route to the certain destination has drawbacks in real time road conditions [13]. The drawbacks are:
In olden days, they refer to a hard copy of the atlas but it is quite obvious.

Later on, GPS become popular in many countries for searching the route on a local map database but the real time road conditions are not taken into account.

Nowadays, VANET have been growing in research areas by increasing road safety measures in wireless technology [11, 13]. It helps in improving road traffic safety system by reducing accidents for better utilization of roads and resources such as fuel and time. Apart from the safety, it securely communicates and shares e-mail, video and audio [10].
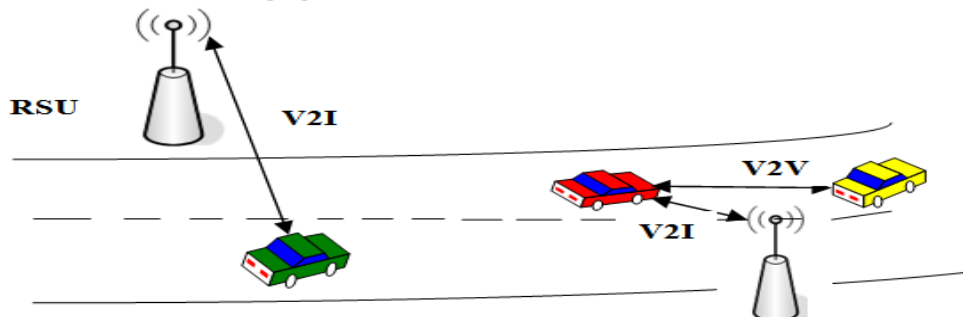
Fig.1.Vehicular Ad Hoc Networks

This paper is organized in six sections. In section **2** we discuss about the main routing protocols in VANET. In section **3** we discuss about the problem statement. In section **4** we discuss about the proposed algorithm. In section **5** we discuss about the results and analysis of this paper. The final section **6** concludes the overview of this paper and its future work.

II. ROUTING PROTOCOLS

VANET is one of the areas in ad hoc networks. The main routing protocols used in this paper is AODV(On Demand Distance Vector Routing), DSR (Dynamic Source Routing), DSDV (Destination Sequence Distance Vector) with DSRC (Dedicated Short Range Communication Band) of IEEE802.11p WAVE(Wireless Access in Vehicular Environments) for shortest path destination[3].

2.1 AODV Routing Protocol

AODV protocol store and update the routing information in routing table as in both forms of unicast and multicast [4, 5, 6]. It reduces delay as well as overhead for large number of packets. It delivers the packets from source to destination in two methods. They are **i) Route Discovery.**
ii) Route Maintenance.

2.1.1 Route Discovery

It sends and forward for a query from source to destination in a short period of time using RREQ (Route Request) and RREP (Route Reply) control packets [1].
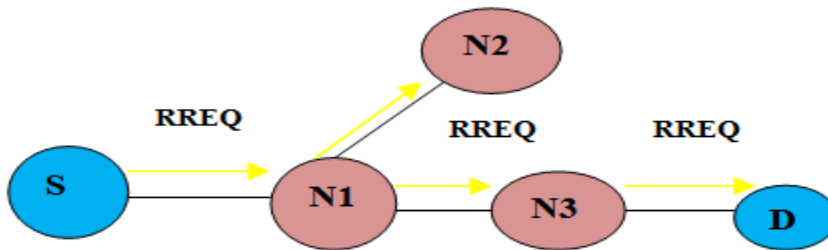
Fig.2. Route Request from source to destination.
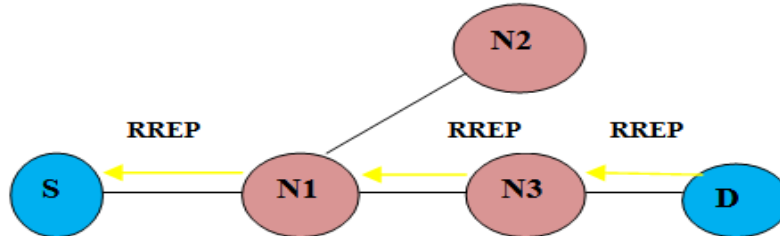
Fig.3.Route Reply from destination to source.

2.1.2 Route Maintenance

If there is any link breakage between nodes to destination then it sends error message to the source. Therefore, it diverts the shortest route path.
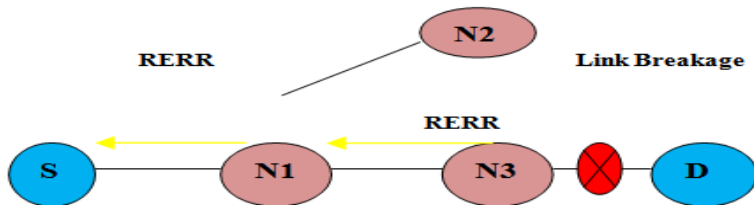
Fig.4.Route Maintenance

2.2 DSR Routing Protocol

Dynamic source routing protocol is like AODV protocol [6]. It helps to maintain the entire routing network from source to destination.

2.3. DSDV Routing Protocol

It is a proactive routing protocol. If there is any change occurs in the network it updates the table periodically and then it broadcasted to the every other node in the network [7].

III. PROBLEM STATEMENT

There is a problem for occurring accidents due to high speed vehicles in a highly congested road. To avoid this problem, chord algorithm is proposed in this paper and priority is given to every vehicle to reduce traffic congestion [12].

IV. PROPOSED ALGORITHM

The proposed algorithm is chord algorithm and are discussed below in detail

4.1. Chord Algorithm

Initially a vehicle authenticated by Trusted Authority (TA) via RSU for identifying best destination route. After authentication, it encrypts and decrypts the message using its own private key. But time consuming process [9, 10].

The aim of our paper is to, network checks each vehicle speed for avoid accidents and traffic congestion based on predecessor and successor vehicle's speed using chord algorithm [12]. Suppose vehicle moves high speed means, the network diverts that vehicle based on predecessor and successor vehicle's speed.

Procedure Vehicle Detection ( )
{
int MaxB, MinB;
Gather neighbor information
Select main forwarder
if(MaxB>=MinB)
{
MaxB=forwarder location– sender location;
}
else
{
(MinB) = ShortestPathSelected ( );
}
Insert Emergency information in the message
Send Message
} % end procedure

We can verify the neighbor nodes information of the Requested Node like predecessor node Id with speed and successor node Id with speed using chord algorithm in VANET. These are verifying the node Id's and location Id's then we can detect the requested node speed [2].

For this purpose we have to create the list of the neighbor nodes information for each node. Although vehicle will identify the traffic through road breakage or an accident is occurred means, the RSU will display the alternative path for accident vehicles to reach the destination.

V. RESULTS AND ANALYSIS

We analyze the performance of vehicle movement using chord algorithm in terms of throughput and delay. The output result shows reduced in delay as well as traffic congestion with high throughput. The rate of accidents is also reduced in this paper. The simulation is done by using ns2.2 (Network Simulator).

5.1 RSU Vs Network

The graph 5 shows the performance of priority of vehicles with respect to RSU and network [8]. A high priority vehicle takes alternate path to reach their destination. High throughput with less latency [17].
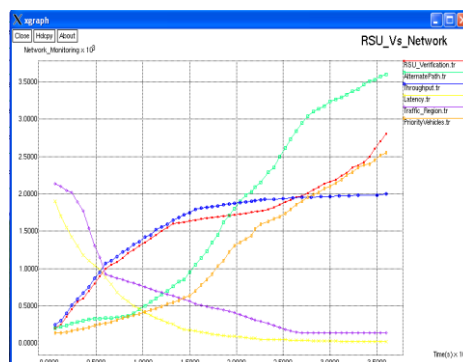
Fig.5.Road Side Unit (RSU) Vs Network

5.2 Timing Vs Vehicles

The graph 6 shows the performance of vehicles with respect to time. RSU monitor and broadcast the message with less latency and collision [12, 16].
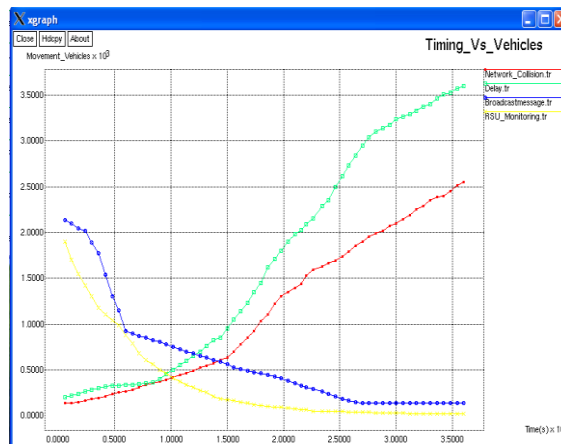
Fig.6.Timing Vs Vehicles

5.3 Timing Vs RSU Verification

The graph 7 shows the verification of vehicle speed with respect to time and road side unit. The accidents are reduced for a high priority of vehicles.
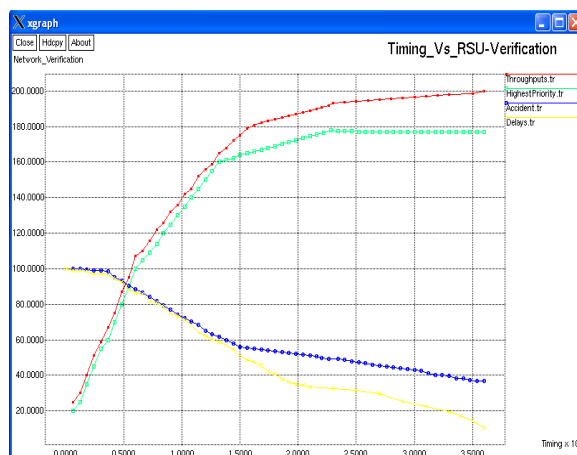
Fig.7.Timing Vs RSU Verification

VI. CONCLUSION AND FUTURE WORK

From this we conclude that by satisfying all security and privacy requirements of VANET, our aim is to apply to the situation that the route searching process is done by a central server which collects and verifies the vehicle speed and road conditions from RSUs [9, 10]. The simulation results in NS2 shows the performance of VANET of high throughput, less latency and reduction of accidents with time Vs RSU verification compared with the existing system of Global positioning system (GPS) and vehicle to vehicle communication network (V2V) [20].For further performance we are implementing our VSPN on a test bed.

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Image Authentication Using Digital Watermarking

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ABSTRACT:

Watermarking is a technology used to embed some kind of information inside a digital content (text, image, audio or video) using different techniques. The embedded information depends upon the application. Watermark should be robust and imperceptible. Robustness of watermark can be explained in terms of successful recovery of watermark from recovered content which may contain different types of noises and compression effects. After recovering the watermark, the recovered and original watermarks are compared by calculating of similarity factor (SMF) of these two watermarks. If the similarity factor is closer to one than we can conclude that the content is original and/or authenticated. This paper entails the study of watermarking technique and delve deeper to improve the robustness of the image. To achieve this, a detailed insight is provided into few techniques explaining each one as a comprehensive step by step procedure and calculating SMF and Peak signal to Noise ratio (PSNR) for different samples considering various attacks.

Keywords: Authentication, Watermarking, Discrete Cosine Transform, Noise Attacks, Similarity Factor, Peak Signal to Noise Ratio.

I. INTRODUCTION

Image Authentication is the application of image processing and domain expertise to discern if a questioned image or video is an accurate representation of the original data by some defined criteria. The digital communication technology (internet) confronts various troubles related to the privacy and security of the data. Security techniques are required because of unauthorized access of data without permission. So, it is necessary to protect data on the internet. For providing the security of digital data various techniques are used like encryption, decryption, cryptography, steganography and digital watermarking. A Digital Watermark is used to communicate copyright information about an image in order to reduce copyright infringement. A person opening a digitally watermarked image in an image editing application or our Internet- or Windows-Explorer reader receives notification through a copyright symbol ((c)) that the image contains copyright and ownership information. The digital watermark can provide a link to complete contact details for the copyright holder or image distributor, making it easy for the viewer to license the image, another one like it, or commission new work. Digital watermarks are added to digital images in a way that can be seen by a computer but is imperceptible to the human eye; yet provide images with a durable, persistent identity. A digital watermark carries a message containing information about the creator or distributor of the image, or even about the image itself. We vary the digital watermark energy to help hide the digital watermarks within the image so that it remains imperceptible. The digital watermark is robust, surviving many typical image edits and file format conversions.

II. RELATED WORK

Watermark is basically categorized in two categories on the basis of processing, namely,

- Spatial Domain
- Transform Domain

2.1 Spatial Domain Techniques

Spatial Domain approaches use the minor changes in the pixel value intensity. The simplest example of the former techniques is to embed the watermark in the least significant bits of image pixels. In other words, significant portions of low frequency components of images should be modified in order to insert the watermark data in a reliable and robust way. For instance, an image is divided into the same size of blocks and a certain watermark data is added with the sub-blocks. In this technique, watermark is embedded by directly amending

the pixel values of the host image/video. The foremost advantages of pixel based methods are that they are conceptually simple having very low computational intricacies. These methods are, therefore, commonly used in video watermarking where the prime concern is real-time performance [2]. Methods of watermarking in spatial domains are namely:

- Correlation based Techniques
- Least Significant Bit Modification (LSB)

2.1.1 Correlation based Techniques:

In this technique, the watermark W(x, y) is added to the original content O(x, y) according to the equation.

$$Ow(x, y) = O(x, y) + kW(x, y)$$

where, k is a gain factor and Ow is the watermarked content. As we increase the value of k, it will expense the quality of watermarked contents.

2.1.2 Least Significant Bit Modification (LSB):

Least Significant Bit modification (LSB) is the simplest technique of this domain. In this method, the watermark is just embedded into the least significant bits of the original video or flips the LSB. Though it is the most popular scheme due to its simplicity, but has some limitations like incompetence in dealing with a range of attacks, poor quality of the produced video, least robustness and lack of imperceptibility [3]. In this technique the third and the fourth least significant bits are used for the insertion of watermark. This technique is more robust than the traditional LSB technique for insertion of digital watermark and quality of the watermarked image is also higher [4]. A 12 bit watermark is created from each block of the host image in this technique and the watermark is embedded in the last 3 significant bits of each block. This technique is efficient for tamper detection in images [5].Generalized patchwork algorithm is an extension of the modified patchwork algorithm (MPA). The MPA inserts the watermark into the image additively and changes the mean of the pixels accordingly. The GPA combines both additive watermarks and multiplicative watermarks. The embedding functions of the GPA determine the embedding functions of the GPA determine the embedding parameters adaptively according to the host signals. Detection functions of GPA also determine threshold adaptively. The advantage of GPA is that it is sufficiently robust against various signal processing operations specially against compression attacks [6].

2.2 Transform Domain Techniques

Transform domain is also called frequency domain because values of frequency can be altered from their original. In this method, transform coefficients are modified for embedding the watermark. The most important techniques in transform domain are discrete cosine transform (DCT) and Discrete Wavelet Transform (DWT).This watermarking algorithm is based on image segmentation and Discrete Cosine Transform (DCT). The image is first segmented using Expectation Maximization (EM) into blocks of size 8 by 8 pixels. The DCT of each block is computed then. After that a pseudorandom sequence of real numbers is embedded in the DCT domain of each block of image. This technique is robust to common signal distortions including geometric manipulation [7].This digital image watermarking technique is based on discrete cosine transform (DCT) and neural network. The neural network is full counter propagation neural network (FCNN). FCNN has been used to simulate the perceptual and visual characteristics of the original image. The perceptual features of the original image have been used to determine the highest changeable threshold values of DCT coefficients. The highest changeable threshold values have been used to embed the watermark in DCT coefficients of the original image. The watermark is a binary image. The pixel values of this image are inserted as zero and one values in the DCT coefficients of the image [8].This technique of watermarking is based on the Quadratic DCT transform. This technique firstly performs block DCT transform on the host image and selects the transformed DC coefficients in each block to form a new matrix. It then conducts another block DCT transform on the new matrix. The high frequency coefficients of DCT coefficients are selected to embed the watermark. For extracting the watermark this technique does not need original image thus achieves the blind detection. This technique has good imperceptibility and is robust against filtering, noise and other attacks [9].This technique combines FABEMD and DCT to insert watermark in images. The FABEMD decomposition is a method based on decomposing an image into multiple hierarchical components known as Bidimensional Intrinsic Mode Functions (BIMFs) and residue. In the traditional DCT based methods the watermark is embedded directly in the DCT coefficients of the host image. In this technique the watermark is embedded in the DCT coefficients of the residue which makes it more robust and perceptually invisible compared to traditional DCT based watermarking techniques [10].

III. WATERMARKING AND ITS TYPES

There are different classifications of digital watermark algorithms as discussed in [1].Watermark techniques can be broadly categorised into four different clusters:

3.1 According to type of data to be watermarked
- Text watermarking
- Image watermarking
- Video watermarking
- Audio watermarking

3.2 Based on human perception
- Visible watermarking
- Invisible watermarking

Visibility is associated with perception of the human eye so that if the watermark is embedded in the data in the way that can be seen without extraction, we call the watermark visible. Examples of visible watermarks are logos that are used in papers and video. On the other hand, an invisible watermarking cannot be seen by human eye. So it is embedded in the data without affecting the content and can be extracted by the owner or the person who has right for that. For instance images distribute over the internet and watermarked invisible for copy protection.

3.3 Based on information for detection
- Blind or public watermarking: In public watermarking, there is no need for original signal during the detection processing to detect the watermark. Only the secret key is required. For example, in image blind watermarking we do not need the original image.
- Non-blind or private watermarking: In non-blind or private watermark, original signal is required for detection the watermark.
- Semi-blind watermarking: In semi-blind watermarking, sometimes we may need some extra information for detecting the watermark. Some watermarking techniques require access to the original signal just after adding the watermarking, which is called published watermarked signal. This form of watermarking is called semi-blind watermarking.

3.4 Based on processing-domain

- Spatial domain: A watermark technique based on the spatial domain, spread watermark data to be embedded in the pixel value.
- Transform domain: To have imperceptibility as well as robustness, adding of watermark is done in transform domain.

In addition to above, watermark technique can also be classified on the robustness feature.

- Robust watermark: One of the properties of the digital watermarking is robustness. We call a watermark algorithm robust if it can survive after common signal processing operations such as filtering and lossy compression.
- Fragile watermark: A fragile watermark should be able to be detected after any change in signal and also possible to identify the signal before modification. This kind of watermark is used more for the verification or authenticity of original content.
- Semi-fragile watermark: Semi-fragile watermark is sensitive to some degree of the change to a watermarked image.

Furthermore, from application point of view, watermark techniques can be grouped as source based or destination based.

In source based, all copies of a particular data have a unique watermark, which identifies the owner of that data, while in the destination based; each distributed copy is embedded using a unique watermark data, which identifies a particular destination.
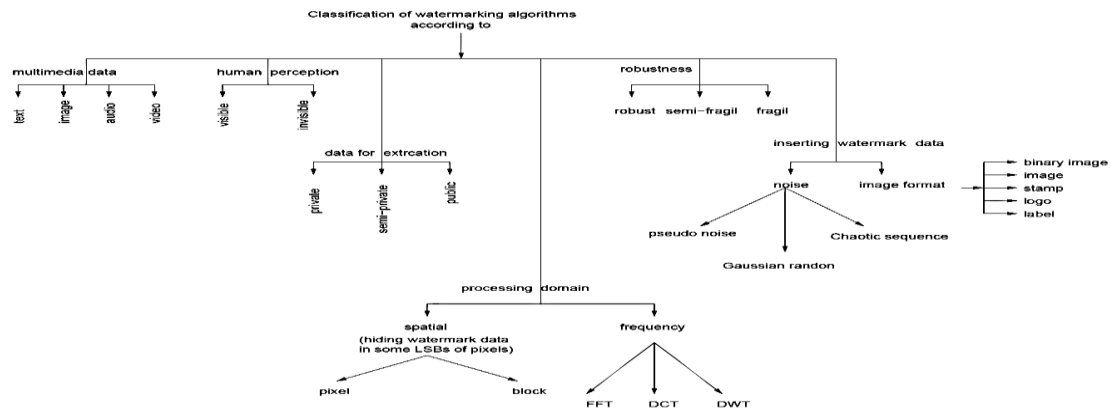
Figure 1: Classification of Digital Watermarking.

IV. PROPOSED METHOD

As the objective is to analyse the robustness of watermarking techniques spatial domain techniques are not considered here, only temporal domain techniques are considered. The DCT technique is used for the implementation. The input RGB image is converted into is gray scale image is decomposed into 8x8 blocks by the 2D DCT which creates low energy matrix coefficients of HL plane. According to the pattern of the randomized watermark image, for each block a variation among the column coefficients is generated. The modified coefficients are once again merged with the unaffected bands to get the watermarked image as discussed in Figure2.

Steps for the proposed method as follows:

1. Input image [MXN].
    1.1 If the image is coloured then convert it into gray scale images
2. Segment the image [MXN] into [8x8] blocks for processing.
3. Apply forward DCT to each of these blocks .
4. Apply block selection method.
5. Modify the selected co-efficient and Embedd watermark.
6. Apply inverse DCT transform on each block [8x8].
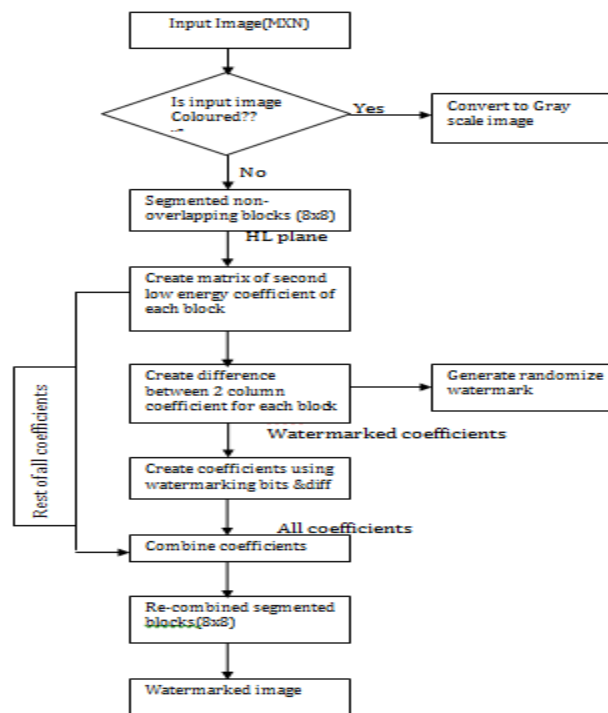
Figure 2: Proposed System

A watermarked image is decomposed into 8x8 block coefficients using DCT. The HL plane coefficients thus created are used to derive the watermarking bits with the help of difference in the coefficients. Now the extracted water mark can be used to find out the similarity factor and the PSNR.

4.1 Advantages of DCT
1. DCT is better than any of the spatial domain techniques because it is robust against varies kinds of attacks like cropping, noising, filtering and sharpening.
2. DCT is a real transform with better computational efficiency.
3. The DCT gives a better performance in the bit rate reduction.
4. DCT also implement fast algorithms. [11]

4.2 Effect of Noise attacks on Watermarks
The effect of various types of noise on the robustness of watermarks is analyzed. Following types of noise are considered

1. Salt and pepper noise: It is a form of noise typically seen on images .It represents itself as randomly occurring white and black pixels. An effective noise reduction method for this type of noise involves the usage of a median filter or a contra harmonic mean filter. Salt and pepper noise creeps into images in situations where quick transients, such as faulty switching, take place.

2. Speckle noise: It is a granular noise that inherently exists in and degrades the quality of the images. Speckle noise results from random fluctuations in the return signal from an object that is no bigger than a single image-processing element. It increases the mean gray level of a local area. Speckle noise is generally more serious, causing difficulties for image interpretation.

3. Gaussian noise: It is statistical noise that has its probability density function equal to that of the normal distribution, which is also known as the Gaussian distribution. In other words, the values that the noise can take on are Gaussian-distributed. A special case is white Gaussian noise, in which the values at any pairs of times are statistically independent (and uncorrelated). In applications, Gaussian noise is most commonly used as additive white noise to yield additive white Gaussian noise (AWGN).

There exist a number of other attacks like JPEG compression, cropping, resizing etc. that affect the quality of the watermark extracted.

The following two quality measures have been considered to evaluate the performance of digital watermarking techniques

➢ **Similarity Factor (SMF):**
For the evaluation of the whole process after the successful recovery of watermark from the watermarked content, the recovered watermark has to compare with original watermark Similarity Factor defined as the co-relation between the original watermark (W_o) and recovered watermark (W_r) using the following equation(1) . The Value of the Similarity Factor (SMF) will be between 0 and 1. The Good Result corresponds to the values closer to 1. SMF is defined as:

$$SMF = (\sum_{i=1}^{N} Wo \times Wr) \div (\sqrt{\sum_{i=1}^{N} Wo \wedge 2} \times \sqrt{\sum_{i=1}^{N} Wr \wedge 2}) \tag{1}$$

Where, N = Total No. of Pixels in the watermark image.

➢ **Peak Signal to Noise Ratio (PSNR):**
Peak Signal to Noise Ratio, often abbreviated PSNR, is an engineering term for the ratio between the maximum possible power of a signal and the power of corrupting noise that affects the fidelity of its representation. PSNR is usually expressed in terms of the logarithmic decibel scale because many signals have a very wide dynamic range. The PSNR is most commonly used as a measure of quality of reconstruction of lossy compression codec. The signal in this case is the original data, and the noise is the error introduced by compression.

The value range of PSNR will vary from types of content compared. One has to be extremely careful with the range of validity of this metric as it is only conclusively valid when it is used to compare results from the same codec (or codec type) and same content. The general accepted values are values more than 30 db. It is most easily defined via the mean squared error (MSE) with following equation(2) for two m * n images I and K where one of the images is considered a noisy approximation (here image k) of the other is defined in following equation (3).

$$MSE = (1/n \times m) \times \sum_{i=1}^{m} \sum_{j=1}^{n} [I(i,j) - K(i,j)]^\wedge 2 \tag{2}$$

$$PSNR = 20 \times \log(\text{Im} \div \sqrt{MSE}) \tag{3}$$

V. EXPERIMENTAL RESULTS

In order to test the performance of the proposed system .We have performed the experiment with five different samples and considered four different noise-attacks. We used [640x480] size standard coloured and gray scale images as a samples using MATLAB as a tool.

	Samples→	Eye		Flower		Butterfly		Palm		Ship	
S.no	Attacks	SMF	PSNR	SMF	PSNR	SMF	PSNR	SMF	PSNR	SMF	PSNR
0	No-Noise	0.9979	43.3475	0.9957	46.2858	0.9869	39.8611	0.6671	41.0703	0.9992	47.9588
1	Salt&PepperNoise	0.9653	42.5401	0.9595	44.8410	0.9595	39.4963	0.6331	40.5953	0.9661	45.9281
2	Speckle Noise	0.7189	41.7554	0.8292	44.9718	0.8292	39.6244	0.3204	39.1183	0.7078	44.7784
3	Gaussian	0.4681	40.1377	0.4842	41.2880	0.4842	38.2070	0.4704	38.9440	0.4890	41.7546
4	For Add. White Gaussian Noise	0.3912	27.4958	0.4156	27.8078	0.4198	27.9331	0.3752	27.3753	0.3811	27.5452

Figure3: Observation Tables of Different Samples with SMF&PSNR
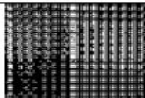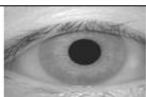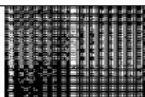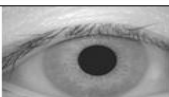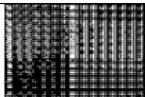
Figure4: Conformance Experiment of the Watermarked Images

VII. CONCLUSION

Watermarking technique is commonly used method for providing security to digital media on the internet technology. In this paper, study of watermark technique based on domain. We discuss the limitation of different techniques. The efficiency of the proposed system is established with the help of experimental results. The proposed algorithm can be further improved using various edge detection techniques and further can be extended to video processing.

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Comparative Performance Evaluation of Ad-hoc on Demand Distance Vector Routing (AODV) and Optimized Link State Routing (OLSR) Protocol for Mobile Ad-hoc Networks in NS-2

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ABSTRACT

Some years before Mobile Ad hoc Networks are not so popular. After some period of time wireless mobile network are very popular due to its unique features. Mobile Ad hoc Network is the one of the branch in wireless networks is shortly known as (MANETs). MANET is a collection of available communication devices or nodes that wish to communicate without any fixed infrastructure or pre define organization of available links. This MANETs research program has mainly focused on developing an efficient routing mechanism in such a highly dynamic and resource constrained network [2]. All routing protocols have assumed to be a trusted and safe for environment. This comparative performance evaluation project work is related to various Mobile Ad hoc Networks (MANETs) routing protocols such as Ad-hoc on Demand Distance Vector Routing (AODV), Dynamic Source Routing (DSR) and Optimized Link State Routing (OLSR). On the bases of different routing protocols as mention earlier we can stimulate using network simulator software which generate different graph as result. And then see comparative analysis effects on routing protocol parameters for Mobile Ad-hoc Networks (MANETs) on the bases of various simulation environments such as area, number of node, testing field, traffic load etc. Following parameters are considered for comparative performance evaluations are Routing Overhead, End-to-End Delay, Scalability and Throughput. This comparative performance study mainly performed between Ad-hoc on Demand Distance Vector Routing (AODV) and Optimized Link State Routing (OLSR). This above mentioned work shows that which routing protocols is best among them and study the graphs obtain in Network stimulating software (NS-2) for Mobile Ad-hoc Networks (MANETs) on the bases of comparative performance evaluation parameters. AODV and OLSR comparison gives the result, which routing protocol is superior among them using NS-2 and this work concludes as a result.

Keywords: Area, AODV, End-to-End Delay, MANETs, Number of Node, Network Simulator 2 (NS-2), OLSR, Routing overhead, Routing Protocols.

I. INTRODUCTION

Now a day wireless mobile networks is very popular in the networking system. Mobile Ad hoc Networks are new generation of networks offering unrestricted mobility without any underlying infrastructure [1-2]. MANET is a collection of available communication devices or nodes that wish to communicate without any fixed infrastructure or pre define organization of available links. This MANETs research program has mainly focused on developing an efficient routing mechanism in such a highly dynamic and resource constrained network [2]. A mobile ad hoc network is a dynamically self-organizing network without any central administrator or infrastructure support. The nodes in MANETs themselves are responsible for dynamically discovering other nodes to communicate each other [2]. It is composed of mobile terminals that communicate one to the other through broadcast radio transmission.

In MANETs node plays very important role. Without node communication could not happened. Now in Mobile Ad hoc Networks are new generation of networks offering unrestricted mobility without fail of any underlying infrastructure. In ad hoc wireless networks, communicating data is vulnerable to lots of potential attacks due to their unique characteristics of having dynamic topology, limited bandwidth and energy constraints in the protocols [2-5].

Wireless network is so sensitive network as compare to other networks. In ad hoc wireless networks, communicating data is vulnerable to lots of potential attacks due to their characteristics of having dynamic topology, limited bandwidth and energy constraints this are the limitations in this network[1-3]. These negative features in the Ad hoc wireless networks provide the opportunity to the net researchers to do research work in this field. In addition to that MANET can be constructed quickly at a low cost, as it does not rely on existing network infrastructure these are some positive points. Due to this flexibility, a MANET is attractive for applications such as military service, disaster relief, robot networks, emergency operations, casual meetings, vehicle networks, campus networks, maritime communications, and so on.

Basically routing protocols are mainly classified in reactive and proactive routing protocol. Proactive are Table-Driven routing protocol and reactive are On-Demand routing protocols. In proactive routing protocols, each node has one or more tables that contain the latest information of the routes to any node in network. These routing protocols maintain different number of table. Proactive networks are not suitable for large networks because table driven approach for different nodes. Optimized Link State Routing (OLSR) protocol is the example of table driven. In reactive routing protocols, such as the Ad hoc On Demand Distance Vector (AODV) protocol nodes find routes only when required these protocol takes lazy approach to routing and they do not maintain or constantly update their route table with the latest route topology. The route discovery usually occurs by flooding the route request packets through the network and Ad hoc On Demand Distance Vector (AODV) routing protocol is the one of the example.

II. WHAT IS WIRELESS NETWORK?

The wireless network is the new emerging technology which allow user to asses information and service electronically in there geographical position. This type of infrastructure network made up of networks with wired and fixed gateways. A mobile host communication with a bridge in network primarily called base station available within communication radius. This area of infrastructure network radius defined in program. This wireless network differentiated on the bases of infrastructure based network and infrastructure less (Ad hoc) networks. In infrastructure based network consist with wired medium and having node base station fixed. In the infrastructure less (Ad hoc) networks nodes are connected without wired and base station is not fixed in this situation. In Ad hoc networks mobile unit that is node can move random geographically while it is communicating. In this ad hoc network all nodes are mobile and can be connected dynamically in random manner. This is bigger advantage of MANETs. When mobile unit goes out of range of one base station then it connects automatically with new base station and start communicating and information exchange happened in between two nodes this information in the form of data packets. The nodes in network function like routers which found and maintain routes to other node. The node in mobile ad hoc network can be cell phone, laptop, PDA and any device to capable of do communication. In short wireless network system is portable system with self-organizing infrastructure.
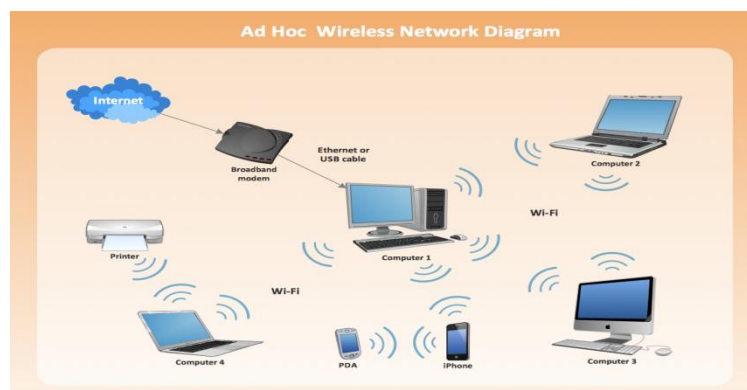

Figure 1. Wireless Ad hoc networks.

2.1 Types of Routing Protocols in MANETs

Basically routing protocols mainly classified in two types such as reactive and proactive routing protocols. In reactive routing protocol, the Ad hoc On Demand Distance Vector (AODV) protocol nodes find routes only when required and Dynamic Source Routing (DSR) is also an on-demand protocol and features similar route discovery as AODV. A source route is appended to all packets and intermediate nodes, and it uses this source route to forward data. In proactive routing protocols, each node has one or more tables that contain the latest information of the routes to any node in network. These routing protocols maintain different number of table. Proactive networks are not suitable for large networks because table driven approach for different nodes and Optimized Link State Routing (OLSR) protocol is the example of table driven.

The routing protocols of MANETs can be classified in two main types. Reactive and Proactive are the main types. Figure 2 shows diagrammatical classification of MANETs along with some relative examples routing protocols.
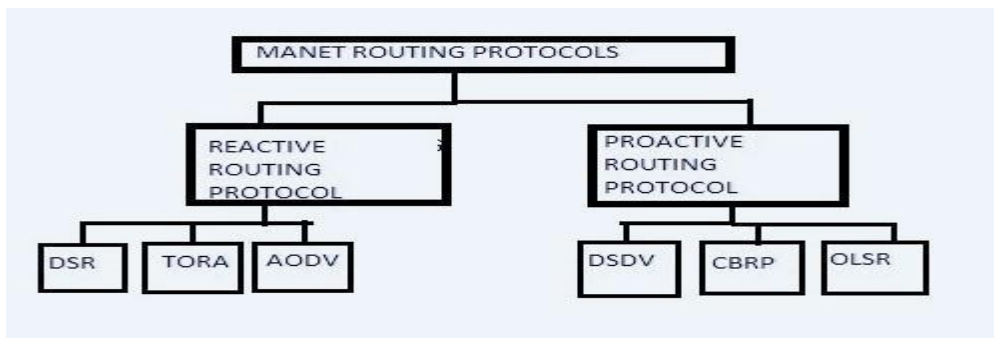
Figure 2. Classification of MANETs Routing protocols [4].

3. Information about Ad hoc On Demand Distance Vector (AODV) routing protocol and Optimized Link State Routing (OLSR) protocol.

3.1 Ad Hoc on Demand Distance Vector Routing (AODV)

AODV is the on demand routing is gives the better performance for the more number of nodes. Path or links are created on demand bases. Reactive routing protocols not maintain the table for path discovery. Ad hoc mobile wireless network is the one of the branch in wireless networks of mobile nodes. Basically routing protocols mainly classified in two types such as reactive and proactive routing protocols. In reactive routing protocol, the Ad hoc On Demand Distance Vector (AODV) protocol nodes find routes only when required and features similar route discovery as AODV and DSR, TORA are some examples. A source route is appended to all packets and intermediate nodes, and it uses this source route to forward data. It is the most important routing protocol in mobile wireless networks. The Ad Hoc On-Demand Distance Vector routing protocol (AODV) is an improvement of the Destination-Sequenced Distance Vector routing protocol (DSDV) [5]. This is the main important functioning of Ad Hoc On-Demand Distance Vector routing protocol (AODV) in MANETs.

Ad Hoc on Demand Distance Vector routing protocol (AODV) mainly come under the reactive protocols. Reactive protocols discover routes only when needed. When node wants to communicate with another node then it checks its existing information with destination route node. If this checking is positive then communication established between source and destination node and further data exchange is going to be happened. RREQ request from source to destination show in diagram given in Figure 3 which forms discovers the path towards destination. After sending RREQ packet request to destination then destination node send back the RREP packet request send back to source this shown in Figure 4. These RREP packets decide the shortest routing path between sources to destination. Figure 5 shows the whole scenario happened while RREQ and RREP packet request move in network.
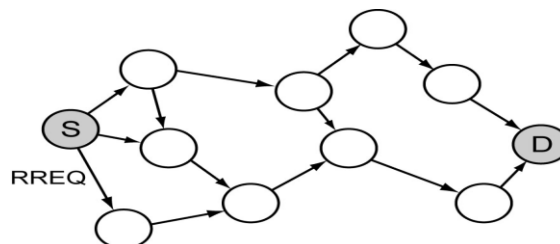

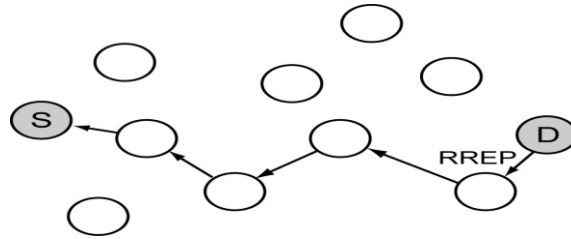Figure 3. A RREQ Source to Destination path generation

Figure 4. A RREP Packet send back to Source.

Advantages:
- On demand type give the supporting for large no of network.
- Need lower delay for connection setup.
- Table is not created for the path discovery in the network.
- It creates the routes on-demand basis.
- Shortest path can be found in ad hoc network.
- Destination sequence numbers are used to find the latest route to the destination.
- AODV tries to minimize the number of required broadcasts.

Disadvantages:
- Periodic route formation creates unnecessary bandwidth consumption.
- Does not follow the unidirectional links.
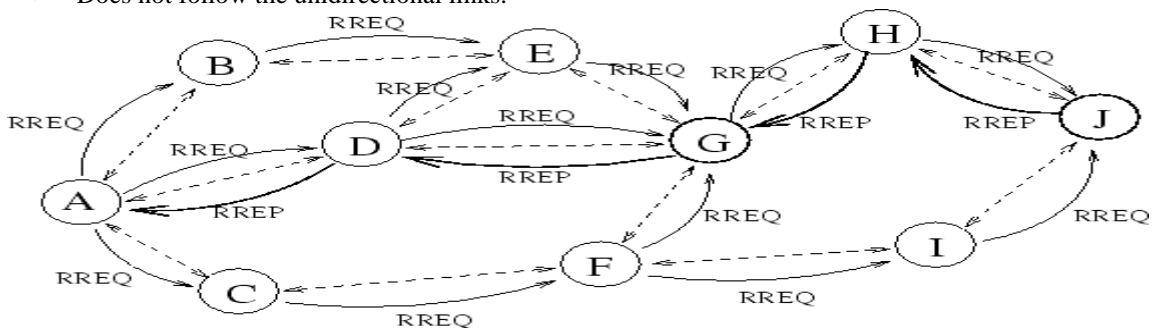
Figure 5. RREQ and RREP packet request.

3.2 Optimized Link State Routing (OLSR) protocol

Optimized Link State Routing Protocol popularly known as (OLSR) is come under proactive routing protocol, so routes in network are always immediately available when needed. OLSR is an optimized version of a pure link state protocol. Due to this proactive nature finding shortest path is very easy. So the topological changes cause the flooding of the topological information to all available hosts in the network. OLSR uses two kinds of control messages: Hello and Topology Control (TC). TC message are used for broadcasting information about own advertised neighbors which include at least the MPR selector list. Hello message are used for finding the information about the link status and the host neighbors. The proactive characteristic of the protocol provides that the protocol has all the routing information to all participated hosts in the network. To reduce the possible overhead in the network protocol uses Multipoint Relay (MPR). The idea of MPR is to reduce flooding of broadcast by reducing the same broadcast in some region in network [8]. The drawback of OLSR protocol requires each host periodically to send the updated topology information throughout the entire network. This increases the protocols bandwidth usage.
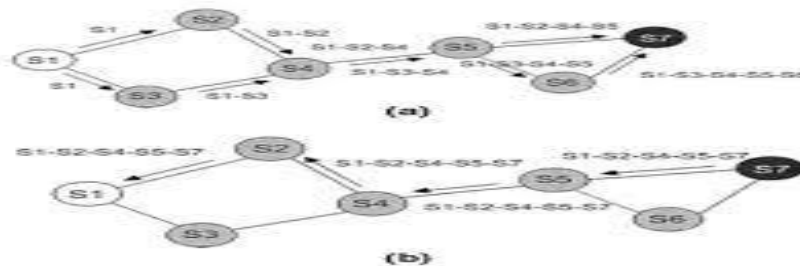
(a) Route Discovery (b) Using route record to send the route reply
Figure 6. OLSR path discovery route S1 source to S7 destination

Advantages:
- This is useful for the large network due to its table proactive approach.
- Throughput is high.
- End-to-End delay is less.

Disadvantages:
- OLSR protocol requires each host periodically to send the updated topology information throughout the entire network.
- Scalability is high.
- Increase the protocols bandwidth usage.

IV. PROJECT SCENARIO IN NS-2

Our project work is done in the network simulating environment. For the simulation of the developed system latest version 2.35 of NS-2 has been used in this project work. This setup is done on the windows operating system, for doing this primarily we have to install Oracle VM virtual box on windows 7 computer. Then Oracle VM virtual box give the platform of LINUX operating system to run Ubuntu 12.04 (32 bit) in this virtual system to do actual simulation of project operation NS-2 network simulating software. Some project scenario is given below.

4.1 Scenario
- Antenna model used is Omni Antenna.
- Radio propagation model used is Two-Ray Ground.
- Nodes are moving at constant random speed.
- Nodes are being generated randomly at random position.
- Topology of 1000*1000 is taken for simulation.
- Nodes are generated at random time as if few nodes are entering into the topology.
- Movement is linear and node speed is constant for a simulation.

4.2 Node characteristics
- Nodes in the network are random moving they are mobile in nature.
- Channel type: wireless
- MAC type: 802_11
- Link Layer Type: Logical Link (LL) type
- Network Interface type: wireless
- Queue type: Drop-Tail

4.3 Matrix
The following different performance matrices are evaluated the behavior of AODV, OLSR routing protocols which came under wireless network of mobile ad hoc networks (MANETs). For this work below mentioned parameters taken into consideration.

[1] Throughput.

[2] End-to-End Delay.

[3] Scalability.

[4] Routing Overhead.

Table 1. Simulation Parameters for NS-2

PARAMETERS	VALUES
Simulator	NS-2 (version- 2.35)
Routing protocols	AODV and OLSR
Number of mobile node	60

Channel type	Channel/ wireless channel
Network interface type	Phy/ wireless phy
Mac type	Mac/ 802_11
Antenna	Antenna/ Omni antenna
Maximum pack in ifq	50
Area (M*M)	1000*1000
Source type	UDP/ TCP
Mac 802_11 RTS Threshold	3000
Link layer type	LL
Simulation time	80 sec.

4.4 Actual project environment

The Network simulator is a name for series of discrete event network simulators, specifically **ns-1**, **ns-2** and **ns-3**. All of them are discrete-event network simulator.it is tool in which wireless networks simulation can be done due genuine limitations to high cost of implementation, area limitations, etc. In 1996-97, ns version 2 (ns-2) was initiated based on a refactoring by Steve McCanne. Use of Tcl was replaced by MIT's Object Tcl (OTcl), an object-oriented dialect Tcl [2]. The core of ns-2 is also written in C++, but the C++ simulation objects are linked to shadow objects in OTcl and variables can be linked between both language realms. Simulation scripts are written in the OTcl language, an extension of the Tcl scripting language [2-4].

At presently, ns-2 consists of over 300,000 lines of source code, and there is probably a comparable amount of contributed code that is not integrated directly into the main distribution (many forks of ns-2 exist, both maintained and unmaintained). It runs on GNU/Linux, FreeBSD, Solaris, Mac OS X and Windows versions that support Cygwin. It is licensed for use under version 2 of the GNU General Public License [6-7]. This is the basic information related to NS-2.

There are some general processes of creating a simulation in ns-2 as per several steps. These steps are as follows:

- Topology definition: to ease the creation of basic facilities and define their interrelationships, ns-2 has a system of containers and helpers that facilitates this process.
- Model development: models are added to simulation (for example, UDP, IPv4, point to-point devices and links, applications); most of the time this is done using helpers.
- Node and link configuration: models set their default values (for example, the size of packets sent by an application or MTU of a point-to-point link); most of the time this is done using the attribute system.
- Execution: simulation facilities generate events, data requested by the user is logged.
- Performance analysis: after the simulation is finished and data is available as a time stamped event trace. This data can then be statistically analysed with tools like R to draw conclusions.
- Graphical Visualization: raw or processed data collected in a simulation can be graphed using tools like Gnuplot, matplotlib or XGRAPH [5].

4.5 Information to Nam file

NAM is a Tcl/TK based animation tool for viewing network simulation traces and real world packet traces. A network animator that provides packet-level animation and protocol-specific graphs to aid the design and debugging of new network protocols have been described. Taking data from network simulators (such as ns) or live networks, NAM was one of the first tools to provide general purpose, packet-level, and network animation, before starting to use NAM, a trace file needs to create [7]. This trace file is usually generated by NS. Once the trace file is generated, NAM can be used to animate it. A snapshot of the simulation topology in NAM for 60 mobile nodes is shown in figure 7. Which is visualized the traces of communication or packets movements between mobile nodes.
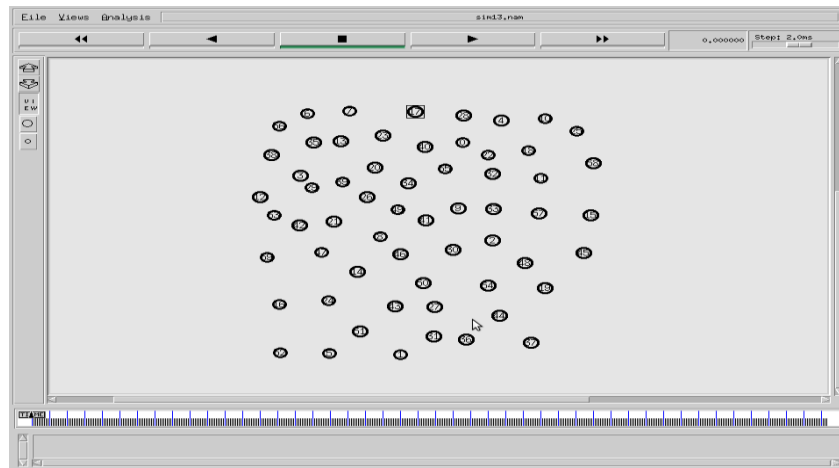
Figure 7. Nam window snapshot for random mobile nodes.

V. INFORMATION TO SIMULATION MODEL

The objective of this project is to performance evaluation of two routing protocols for mobile ad hoc networks by using an open source network simulation tool called NS-2. Two routing protocols: AODV and OLSR have been considered for performance evaluation in this project work. The simulation environment has been conducted with the LINUX operating system, because NS-2 works with Linux platform only. This gives the diagrammatical flow related to project.
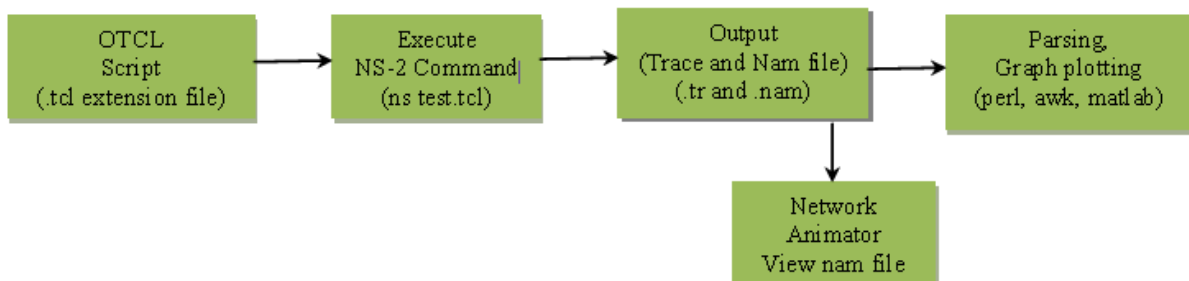
Figure 8. Simulation overview [5]

Whole simulation study is divided into two part one is create the node that may be cell phone, internet or any other devices i.e. NS-2 output. It's called NAM (Network Animator) file, which shows the nodes movement and communication occurs between various nodes in various conditions or to allow the users to visually appreciate the movement as well as the interactions of the mobile nodes and another one is graphical analysis of trace file (.tr).

Figure 8 Simulation overview depicts the overall process of how a network simulation is conducted under NS-2. Output files such as trace files have to be parsed to extract useful information. The parsing can be done using the *awk* command (in UNIX and LINUX, it is necessary to use gwak for the windows environment) or Perl script. Trace files contain the traces of event that can be further processed to understand the performance of the network. The results have been analyzed using Excel or Matlab. A software program which can shorten the process of parsing trace files (Xgraph and TraceGraph) has also been used in this project. However, it doesn't work well when the trace file is too large. To generate trace file and nam file, we call tcl script in CYGWIN command shell. By varying the simulation parameter shown in table 1, we can see the graphical variation between various performance metrics like Routing Overhead, End-to-End Delay, Throughput and Scalability.

5.1 Actual project NAM windows in project

Following various Nam windows are taken on actual run time of project with some time interval to show the working of nodes on that time period. Nam window shows original view of run time project on screen with node activity. This Nam window is user define, space is created accordingly in object program file. In this project proj.tcl is program file. These images are gives the actual feel of simulation happened that time.

Below table give some indications related to color and diagrams available in simulation window.

Table 2. Indicative parameter for simulating nam window in NS-2

Sr.no	Parameters	Indication to images
1	Number in circle	Node
2	Node in green circle	Source node
3	Node in red circle	Destination node
4	Black Square	Packet loss
5	Black dotted lines	Packet transmission between nodes

This figure 9 shows the initial image of NAM window at time of 0 sec.
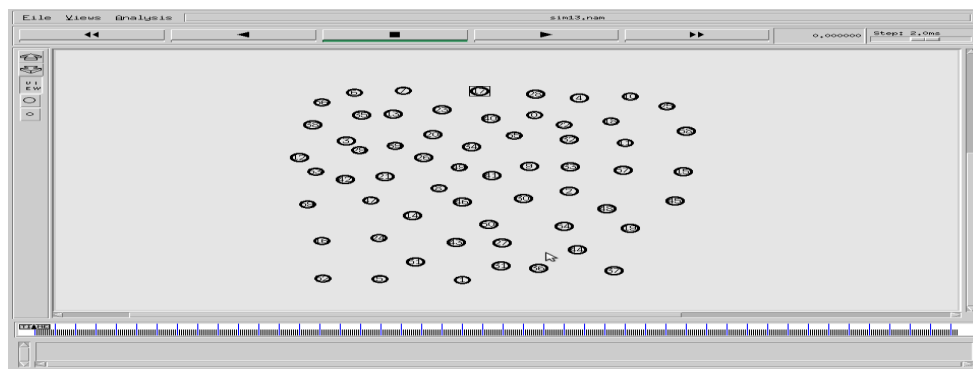
Figure 9. Initial time nam window at (o sec.) time

This figure 10 shows the image of NAM window at time 11 sec.
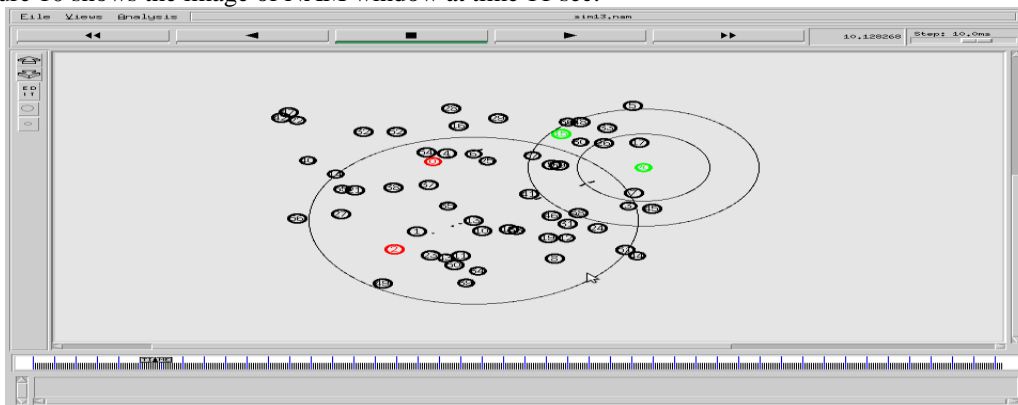
Figure 10. Nam window with (11 sec.) time

This figure 11 image shows at time of 31 sec interval.
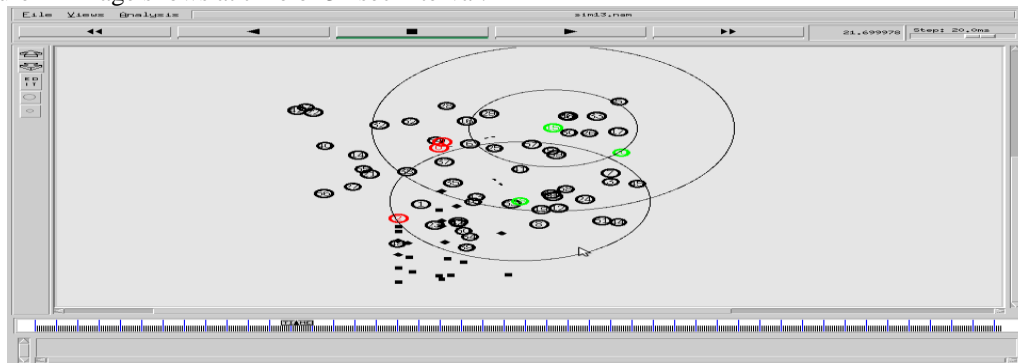
Figure 11. Nam window at (31 sec.) time

Figure 12 at interval of 80 sec. is the last window. This following NAM window which show all packet data transmission and packet losses in the actual scenario.
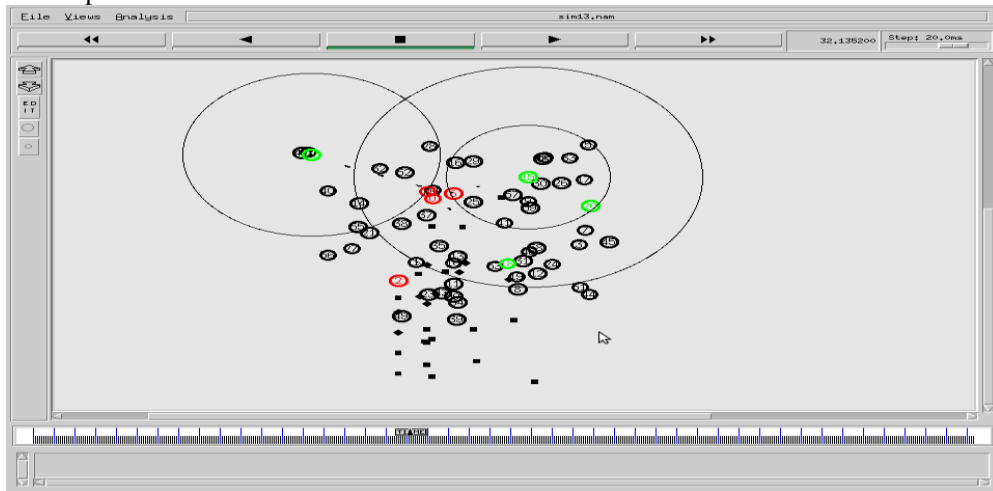
Figure 12. Nam window at (80 sec.) time

IV. RESULT IN GRAPHICAL MANNER

That's below graphs are plotted by collecting actual output data obtained in run time simulation. This output data can be converted in various graphs for observation purpose by using Microsoft excel Tool in windows.

[1] **Throughput-** Throughput is the number of packets that is passing through the channel in a particular time period. As per the observation when graph shows the high reading at the particular time period. That shows the higher is the throughput better is the particular Routing Protocol. Unit of this throughput is Kbps.

Throughput = Total received Bytes / Elapsed Time
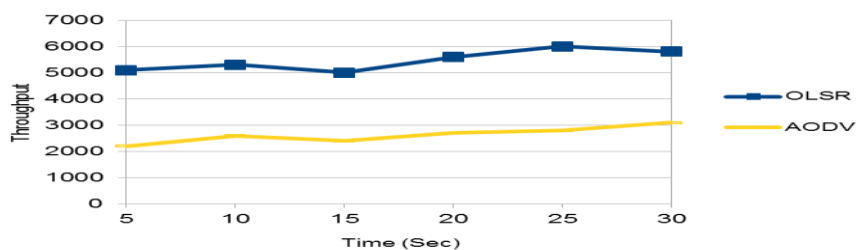
Figure 13. Throughput Vs. Time (Sec.)

[2] **End-to-End Delay-** In which specific packet is transmitting from source node to destination node and calculating the difference between send time and received time is called End-to-End Delay. In this case if value in graph shows less value this is the better Routing Protocol among them. Many factors like route discovery, queening propagation and transfer time gives the performance of delay.

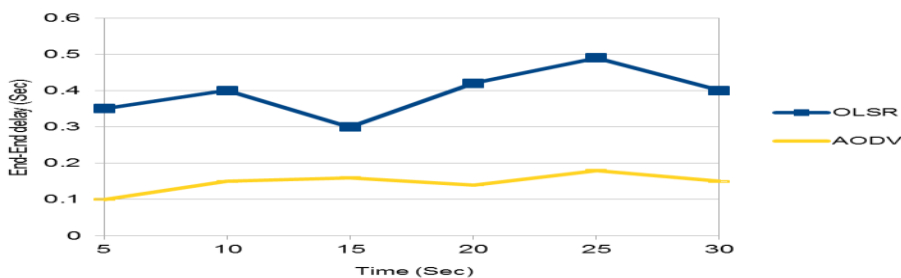**End-to-End Delay = (Received time – Send time) / Data packets received**

Figure 14. End-to-End delay Vs Time

[3] Scalability- Scalability is called as the ability of network to handle the node in network. It is just handling the node in given network system. Higher the value of in scalability that protocol is superior among the two.
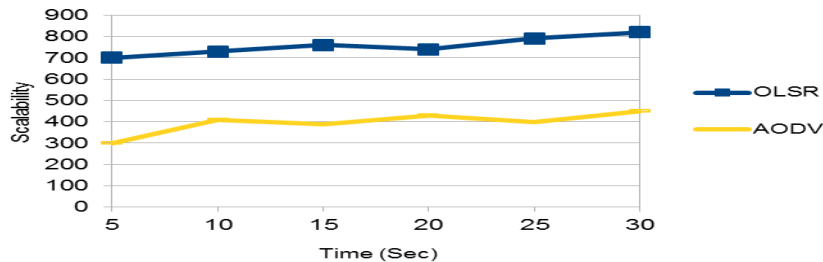
Scalability = Ability to handle the node

Figure 15. Scalability Vs Time

[4] **Routing Overhead**- Routing Overhead is one of the performance parameter which gives the analytical study of protocols by using such parameters we can able to tell which on is good. If value of the graph is high that shows the better performance of routing protocol. Basically Routing Protocol is the performance parameter to find the best shortest routing path in between two consecutive nodes.

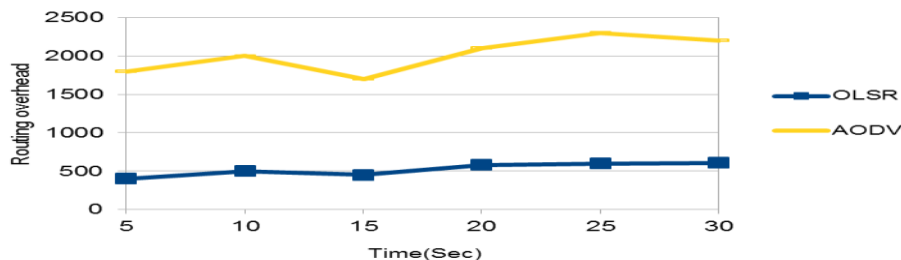**Routing Overhead = find shortest path between the two consecutive node**.

Figure 16. Routing Overhead Vs Time (Sec.)

VII. CONCLUSION

Finally we can make conclusion of this project on the observation, graph obtained in actual run time simulation. Comparative performance evaluation work organized between AODV and OLSR routing protocols in Network Simulator (NS-2) specifically in network simulator 2.35 versions. According to the throughput definition Figure 13 shows OLSR routing protocol is good as compared to AODV. Based on End-to-End delay concept Figure 14 give the clear indication that AODV has lesser value reading as compare to OLSR therefore AODV is having good End-to-End delay. Observing scalability concept in Figure 15 OLSR has capability to handle more number of nodes as compere to AODV protocol in this situation OLSR is the best. Figure 16 shows the output graph of Routing Overhead as graph of higher value give the better routing protocol, according to this concept AODV is the best among them. By observing all resultant graphs of AODV is good for some parameters and OLSR less effective. Project in Network Simulator conclude that AODV routing protocol is best as compare to OLSR routing protocol in this evaluation work.

VIII. ACKNOWLWDGEMENTS

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