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Targeted Visual Content Recognition Using Multi-Layer Perceptron Neural Network

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ABSTRACT

Visual Content Recognition has become an attractive research oriented field of computer vision and machine learning for the last few decades. The focus of this work is monument recognition. Imagesof significant locations captured and maintainedas data bases can be used by the travelers before visiting the places. They can use images of a famous building to know the description of the building. In all these applications, the visual content recognition plays a key role. Humans can learn the contents of the images and quickly identify them by seeing again. In this paper we present a constructive training algorithm for Multi-Layer Perceptron Neural Network (MLPNN) applied to a set of targeted object recognition applications. The target set consists of famous monuments in India for travel guide applications. The training data set (TDS) consists 3000 images. The Gist features are extracted for the images. These are given to the neural network during training phase.The mean square error (MSE) on the training data is computed and used as metric to adjust the weights of the neural network,using back propagation algorithm. In the constructive learning, if the MSE is less than a predefined value, the number of hidden neurons is increased. Input patterns are trained incrementally until all patterns of TDS are presented and learned. The parameters or weights obtained during the training phase are used in the testing phase, in which new untrained images are given to the neural network for recognition. If the test image is recognized, the details of the image will also be displayed. The performance accuracy of this method is found to be 95%

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Keywords: *Visual content recognition, Multi-Layer Perceptron Neural Network, Gist feature.*

I. INTRODUCTION

There are various recognition applications of artificial neural network like pattern recognition, face recognition, traffic sign recognition, character recognition, etc. Recognition of visual content is a typical application for artificial neural network. This work aims monument image recognition which will be useful to the tourists. The images obtained may be with the following variations:

[1] Different lengths.

[2] Different angles.

[3] Any occlusions.

[4]Different illuminations.

II. WORKING PRINCIPLE

Recognition using artificial neural network include two major parts. They are training phase & testing phase. Humans can see once an image and can recognize it but artificial neural network requires more and more training for recognition.

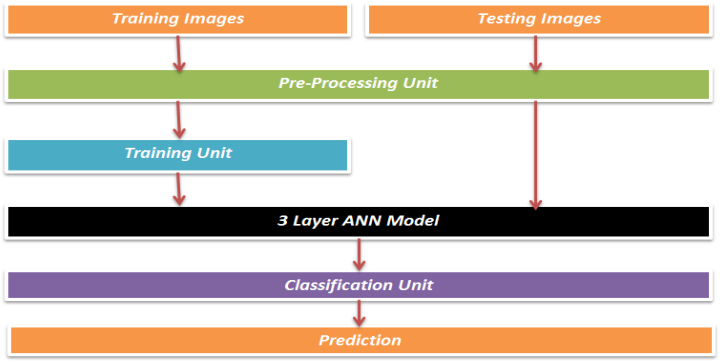

Fig1. Block diagram

Training:

Training is done in step by step process as shown in the figure1. In this work images of different locations are taken 5locations (classes) per each class. So 50*5=250.Each image is trained 12 times for accurate training.Thus250*12=3000, having a training set of 3000 images. Preprocessing is done to each image. Gist feature is extracted for each image and given to the training unit. Training unit applies the back propagation algorithm on the ANN model. Classification gives the class of the current image.If the error is less than accuracy (95%), the process is repeated with a new training example.

Testing:

Testing is done in step by step process as shown in the figure1. In this work images of different locations are taken 5locations (classes) per each class. So 20*5=100, having a testing set of 100 images.Test images are preprocessed as that of training images by gist global feature. After preprocessing image is given to 3 layers ANN Model.3 layer ANN Model recognizes the test image and classifies the class of it.

III. GIST-GLOBAL-FEATURE EXTRACTION

The whole scene recognition is very hard task for an artificial neural network. So Gist-Global feature is extracted for only the image of interesteliminating,surrounding unwanted objects like trees, fountains and humans in the scene.

Gist feature is extracted for each image using the following step:
:

- Convert the image into gray scale image
- Resize the image 256x256.
- Normalize the image intensities to be between 0 to 255.
- Compute the FFT of the image
- Multiply with Gabor transformation function (8 orientations and 4 scales – total 32 outputs at this stage),
- Find the inverse FFT of the 32 images.
- Divide each image into 4x4 blocks (total 16 blocks). Find the energy in each block averaging the intensitiesin that block.
- Total 16 outputs per image and total 32 images. This gives a vector of 32x16 = 512 elements.
- This is the final Global feature vector of 512 elements.
- v1= {e0,e1,e2…..e511}

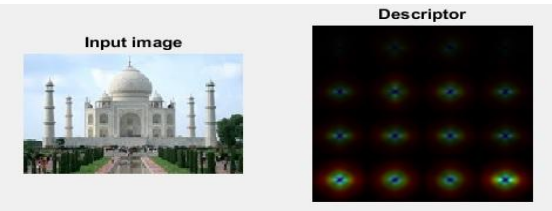

Fig2. Gist feature descriptor

IV. MULTI LAYER PERCEPTRON NEURAL NETWORK

Multi-Layer Perceptron is used for Non-linear way of solving problems. To calculate the Shape, Intensities, Orientation of Image, and Multi-Layer Perceptron is used. The MLP Learns in two ways. They are: Online Learning and Batch Learning. In Online Learning instances are seen one by one. In Batch Learning whole scene is shown all at once. The input signal propagates through the network in forward direction, on a layer by layer basis. These neural networks are common known as Multi-layer perceptron.

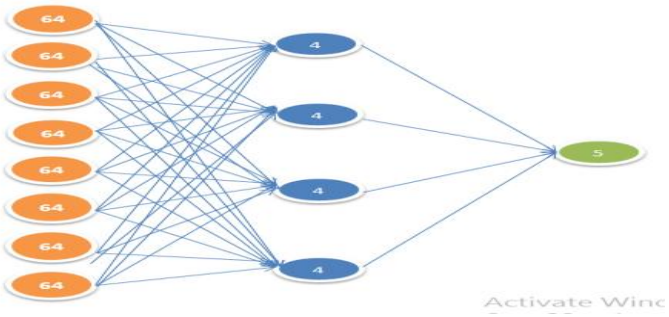

Fig3. Sample MLP

The above figure 3 shows a sample MLP with 8 input nodes , 4 middle layer and 1 output layer. Middle layer is the hidden layer. In this work 512 input layer nodes, 16 hidden layer nodes and 5 outputs are used.

V. RESULTS

At 5 different locations Viz., TajMahal, Statue Of Liberty, Mount Everest, Waikiki Beach, Koneru Center. 50 images are taken in this work per each class. Training images=5*50=250. The ANN is trained 12 times for accuracy, 250*12=3000 images.The test images are 20 per each class, 5*20=100 images.For the TajMahal image is recognized and the corresponding details like history, importance, location, etc., will be displayed for the user example tourists.

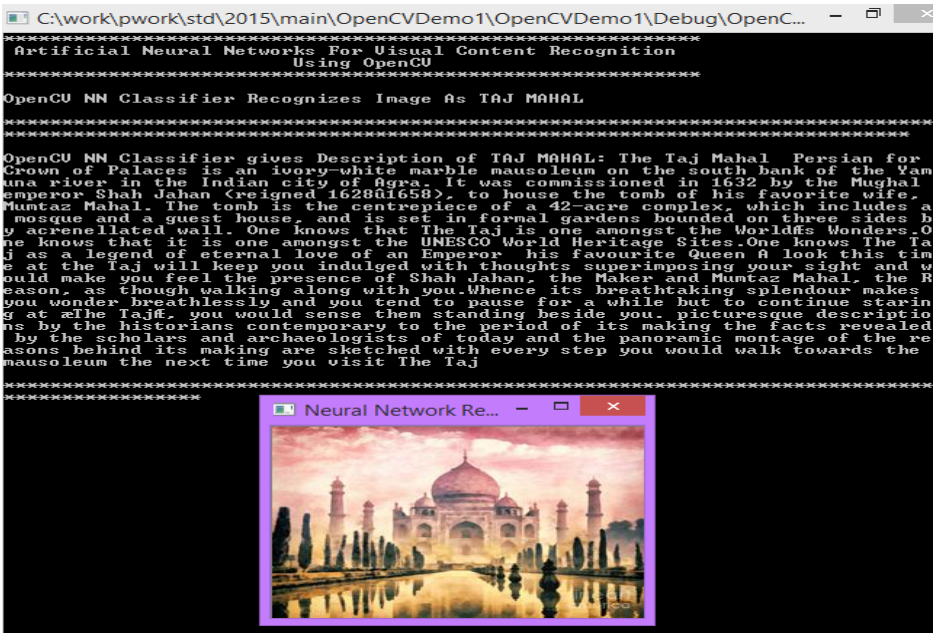

Fig4. Recognition and Description using ANN

VI. CONCLUSION & FUTURE SCOPE:

The application of neural network recognition in targeted Visual Content Recognition (Monument Recognition) is totally a new application. The recognitionof image with ANN of using gist features is done in this work and the accuracy of recognition is about 95%. In this work the images of 5 locations are taken. This method can be validated on large data base of different monument images. This work can be extended, using Deep Neural Networks.

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