FACE DETECTION AND RECOGNITION USING SOM AND ANN

Nikhitha Narasipuram[1], Krishna Veni Choppa[2], Satish Badimisetti[3]

[1,2,3]*E.C.E, L. I. E.T, J .N. T. U. Kakinada, (India)*

ABSTRACT

Over a decade, security has become the main concern of the people due to the increase of thefts. So, in order to keep our data securable we are going to implement the image similarity using Self Organizing Map (SOM) and Artificial Neural Networks (ANN). For this we feed facial images into neural network, each neural unit is tuned to a particular facial image prototype. Our first step is to identify a face with the assistance of illumination variations and facial expressions with different poses. Next step is recognition of a face. For that we use Self Organizing Map (SOM) & Artificial Neural Networks (ANN). SOM mainly deals with training and testing. Training involves database formation of 'n' number of individuals with different poses. In testing we will try to match an image which may or may not be in the database using mapping technique. Afterwards, it will show the recognition id of the image if it is matched. Even though there are many algorithms like Principal Component Analysis (PCA), Independent Component Analysis (ICA). We are using SOM due to its topological ordering. SOM uses weight vectors while recognizing faces. Due to this, it has become successful in recognizing very noisy signal patterns.

 We have developed a face recognition system which not only recognizes the human faces but alsothe faces of animals. Using just a single neural network algorithm SOM results to an accuracy of 97.6%.Our main motto is to create a system with less delay. Such kind of systems can be used for Automatic Target Recognition, Traffic census security & criminal identification.

Keywords: ANN (Artificial Neural Networks), Face detection, Face recognition, PCA (Principal Component Analysis), SOM (Self Organizing Map).

I. INTRODUCTION

Face detection and recognition has many applications. Our intention is to develop an application which can provide security for our information or to any property. To achieve our goal we make use of a technology on the basis of biometrics. Biometrics [1] is a field of study which includes the identification of facial features like iris, finger prints, retina, and so on. This technology provides high security due to the presence of biometric identifiers. These cannot be easily misplaced or shared and not able to get easy access.

Among different algorithms like PCA, LDA, SOM, ICA [2], we have chosen Self Organizing Map in association with Artificial Neural Networks.
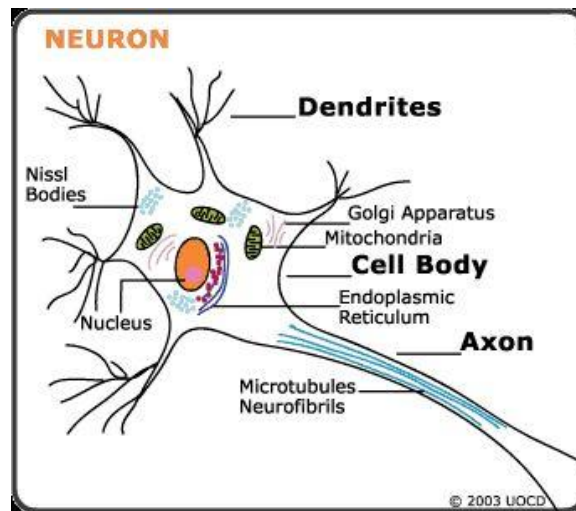
Fig.1 Neuron cell

1.1 Proposed Model

SOM & ANN [3]:SOM is the acronym of Self Organizing Map. SOM uses mapping technique for reduction of identical inputs and modifies its neighbors. In addition to self organizing map we use Artificial Neural Networks too.ANN can also be called as Simulated Neural Network (SNN) or convolution neural networks [4] is an interconnection of artificial neurons which uses a mathematical model for processing the information. Neurons are called as nodes and these are connected together to form neural network.

II. DESCRIPTION OF FACE DETECTION & RECOGNITION

Before recognizing the face it should be detected first. Using the illumination changes we are detecting the faces. Faces can be detected by identifying either the skin texture or individual elements like eyes, nose, and mouth.

2.1 Face Recognition Steps

Face recognition is further classified into face verification and identification.

Face verification: This is the process of authenticating an image which means that verifying whether the picture is valid or not. The performance gets evaluated on the basis of verification rate and false rate. The system which balances both rates is said to be a good system.

Face identification: Recognizing a face by comparing the query image with the images present in the database is known as identification. Hence, initial step is to prepare a database by taking 'n' images and then converting them to format which mat-lab can read. Then we will add those images to database and gives a recognition id.

Identification locates the image which has the highest similarity score. Self-Organizing Map assigns scores on the basis of feature comparison. And these scores are numerically ranked in a descending order. Depending upon the top score the recognized id gets identified.

III. SOM ALGORITHM

Self-Organizing Map algorithm [5] mainly consists of four steps. Those are:

A. Weights get initialized.

B. Tracking the best matching unit on the basis of scores.

C. Training and testing: In training the database formation happens whereas in testing the image gets compared with the database and gives us the recognition id.

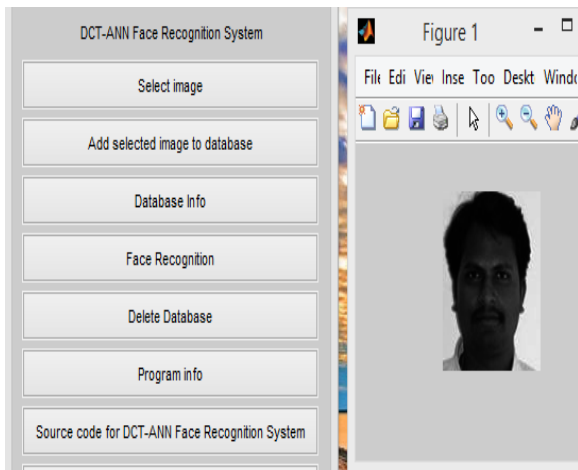**D**. Mapping which gives the accuracy of self-organizing map.

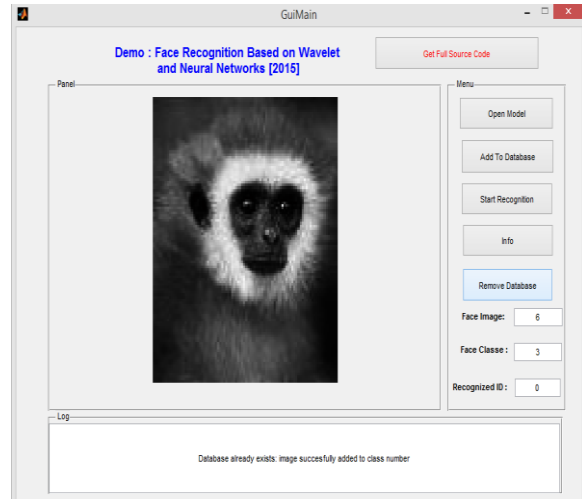**Fig.2 processing of image in training**   **Fig.3 processing of image in testing**

IV. MATLAB ENVIRONMENT

Mat-Lab means matrix laboratory which was developed by LINPACK and EISPACK. Mat-Lab doesn't require dimensioning and can also solve many computational problems. We can write a program either in C or in FORTAN.
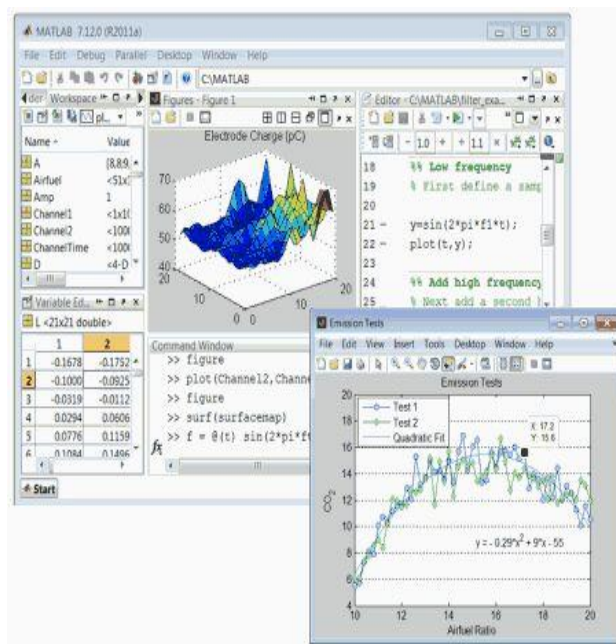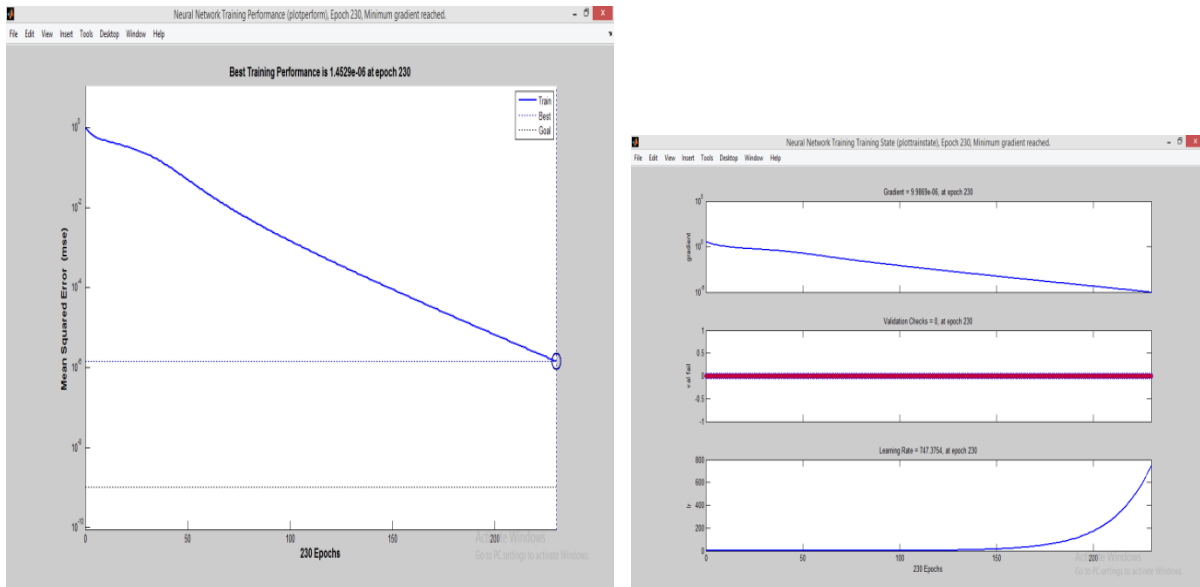

Fig.5 Mat-Lab environment

V. SIMULATION RESULTS

A database of 30 images of different persons in addition with the publicly available database having variations in poses and angles has been tested in the recognition system.

Fig.6 Performance plot   Fig.7 Training characteristics

Efficiency of self organizing map is as shown in the table below.

TABLE I SOM Recognition Accuracy

SR. NO	Number of images in database	Accuracy rate in %
1	5	88.32
2	7	90.5
3	9	95
4	10	97.6

VI. CONCLUSION

So, we have developed a less delay recognition system for identifying both human faces and animal faces using a single algorithm SOM with ANN.Another important feature of this system is it can recognize a face in any pose of any angle even though we haven't added all the poses to our database.

Some of the applications of face detection and recognition are Law enforcement, Criminal identification,secure facial identity& systems Mobile and video identity resolution. It gives us an accuracy rate of 97.6% by creating a database with 30 images of different persons. We can further implement this algorithm for detecting the faces in videos and for facial expression detection and emotion detection like whether the person is smiling and whether the eyes are open or not.

REFERENCES

[1]   Kesava RaoSeerapu et al , International Journal of Computer Science & Communication Networks, *Vol 2(5), ISSN:2249-5789*

[2]   Santaji Ghorpade, Jayshree G., Shamla Mantri, Dhanaji G.(Dec 2010): Neural Networks for Face Recognition using SOM.*IJCST, ISSN-0976-8491, vol 1, issue 2.*

[3]   International Journal of Computer Trends and Technology *(IJCTT) – volume 5 number 4 –Nov 2013.*

[4]   Stefanos Zafeiriou, Cha Zhang and Zhengyou Zhang */ CVIU 00 (2015) 1–33.*

[5]   Shamla Mantri, Kalpana Bapat Neural Network Based Face Recognition Using Matlab,*IJCSET | Feb 2011 | Vol 1, Issue 1,6-9.*