RESEARCH ARTICLE

Evaluation of Performance of the Face Detection Using Skin Colour Model and Face Recognition Using ANN

Ravinder Pal Singh[1], Daljit Kaur[2]

[1]Research scholar Department of Information Technology, Chandigarh Engineering College, India
[2] Assistant Prof, Department of Information Technology, Chandigarh Engineering College, India
[1] Papnejarps@gmail.com, [2] Er.daljitkaur@gmail.com

Abstract— This paper presented a new and robust algorithm for face detection and recognition using skin colour model with Feed Forward neural Network. Skin colour model is used to detect face of region from given input testing image. After detection, Features are extracted from detected face regions using Zernike moment and correlation. Also Extract features from training database. Next step is applied to fuzzy set for pre-processing of extracted features of training image. Fuzzy set has been short listed more match able images (greater than min threshold value of matching feature).The system has been tested on face pix database in which 6600 images of 90 persons of 74 different images of angle variation. On evaluate performance of new algorithm on basis of factor such as accuracy, time, MSE etc. New System was found to have overall accuracy 94.64% at distance 60 to 80 cm of images.

Keywords—Face Detection, Face Recognition, Artificial Neutral Network (ANN), Skin colour model, Zernike moment

I. INTRODUCTION

In the information technology world, the main issue is to maintain the security of information in various fields such as banks, colleges, hospitals, offices, computers etc. Every day in newspaper and social media, Theft made in banks and computers are being reported. To increase the level of security, Researcher works on active topic of Biometric field. Biometrics means to measure and analyse person's characteristics like fingerprints, eye retina and irises, voice recognition, face detection and recognition for authentication and security purpose. Face recognition is popular and fastest biometric technology for security and authentication purpose.

Face detection is the most important step in the face recognition system. Face detection means to identify and locate face region from images. Face detection and recognition systems have already made a lot of algorithms such as Holistic Approach, AI approach; Template matching method, Knowledge based methods etc. Every algorithm has its own advantages and disadvantages. In this work is proposed a new and strong method which is combination of skin colour model for face detection and NNs for face recognition. In this proposed algorithm the problem of false positives has been solved and the accuracy of system has been beefed up.

II. RELATED WORK

Chandan Singh et.al.[1] have proposed a new technique combination of Zernike Moment (ZM) and SIFT features for improving face Recognition. In this paper, two methods are used to extract global and local features from face images. Zernike moment is used to extracted a global information from face images and SIFT descriptor is used to find a local distinct information from face images. This algorithm is highly robust against illumination, pose and expression changes.

Rakesh Rathi et.al [2] have presented a new method to find or measure a similarity of images by using Self-Organizing Map (SOM) .Face Recognition is performed by Probabilistic decision Rule. This paper presents a novel and robust SOM for face recognition. This new method offers very promising results for face identification against illumination/light variation, facial poses and no of expressions variations.

C.Saravanan et.al [3] This paper presents a new face matching algorithm by using Normalized cross –correlation(NCC).This algorithms that help to find face image from template and begin to search for matching with different image of same person taken at different times, or different by sensors by using NCC This algorithm is performed in MAT LAB. The experimental results show that developed method is strong for similarity measure.

Hayet Boughrara et.al [4] presented Constructive training algorithm for MLP neural Network Based Recognition System**.** In this paper methods used for feature extraction are Zernike moments and Gabor features to recognize human face. This algorithm starts a training process with one hidden layer and only one neuron. This is an incremental algorithm because training pattern is learned incrementally and hidden layers are increased one by one, if the mean square error of training data is not reduced or the algorithm gets stuck in a local minimum. Here input patterns are trained incrementally one by one until all patterns are selected and trained. This algorithm was tested on UMIST database. This algorithm improves the recognition rate.

Tolga Alasag et.al [5] have been proposed a new algorithm for face recognition by using Local Zernike Moments (LZM) for low-resolution face images. Local Zernike Moments (LZM) is used for evaluation of the moments for each pixel. This moment shows to achieve robustness and important success in face recognition. The performance of Local Zernike Moments in low-resolution face images is evaluated on FERET database. A new and novel proposed algorithm for face recognition is used for real applications.

Ravinder pal Singh et. al[6] have proposed and implemented a new and strong algorithm of face detection and recognition using skin color model and Artificial NN**.** Skin color model is employed for detecting the faces from given input image .Face Recognition is done by using Artificial Neural network (ANN).

III.EXPERIMENTAL DESIGN AND RESULTS ANALYSIS

A.   Experimental Design:

In previous 'research paper "**Face Detection Using Skin Color Model and Face Recognition Using ANN**" a novel and strong algorithm for detecting faces from given testing image using skin color model was described and implemented. Using Zernike moments and correlation Facial features of detected face of person from testing image and training images of 'Face pix' Database are extracted. Zernike moment is used to extract features in the form of angle of face and length and width of phase. Fuzzy set is applied for preprocessing of training images. Neural Network is applied to the shortlisted of training images..Artificial neural network is used for pattern recognition of system. FFNN is applied to recognize training sample image corresponding to detected face image of person.

In this research paper the performance of above algorithm on basis of performance parameters such as accuracy, elapsed time and recall etc is to be evaluated.

B. Design of Neural Network

Figure 1 illustrates neural the network used in the study. 74 values represented 74 different image of every person for different 90 people as input. Hidden layers is represented as interface b/w input layer and output neuron .20 hidden layers are used in the neural network. Third layer and last layer is the output layer. The output layer value is 1. One value is represented as matching image as corresponding to input testing image.
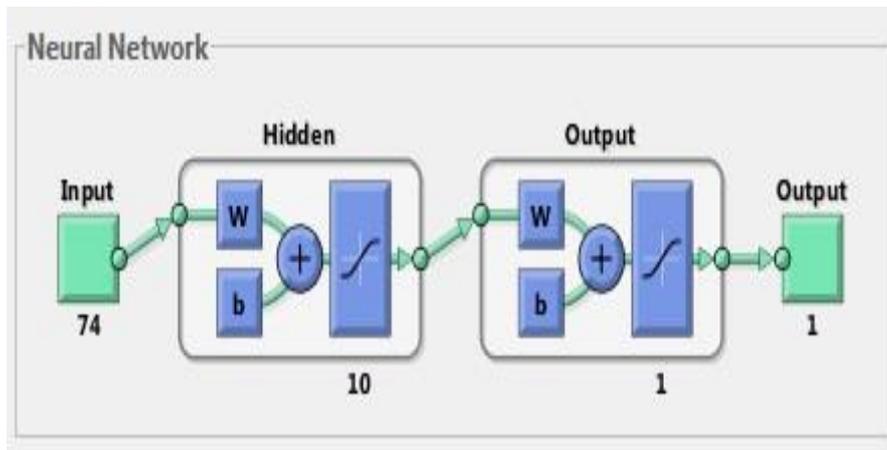
Fig. 2 Design of neural Network

Figure 2 show that performance of neural network. Best performance of the system was seen in 17rd Epochs of the training. At this point system returns mean square error is 0.14059.
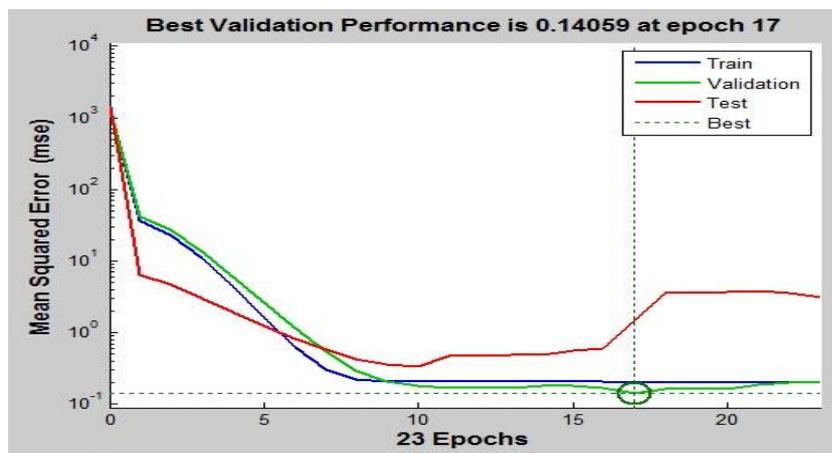
Fig 2: MSE analysis of neural network

C. Result analysis

After building face detection and recognition system, to test the performance of overall system on the basis of accuracy, precision, recall and elapsed time. System has been tested 80 inputs testing images in which 77 (TP+TN=68+9=77) correctly match with corresponding image of person and 3 images incorrectly match.Table1 shows the statistical analysis parameters.

Table 1: The statistical analysis parameters

True Positive	**68**
True Negative	**9**
False Positive	**3**
False Negative	**0**

1. Precision: Precision can be defined as the ratio of relevant retrieved documents and the information needed by the users. High precision defines that the algorithm returns results that are relevant as compared to irrelevant results. It also defines a predictive value that is positive   this is defined in terms of the binary classification. This classification defines the documents

that are retrieved. It is defined in terms of the results that the system returns at some cut-off rank. Precision is also known as sensitivity.

$$\textbf{Precision} = TP/ (TP+FP)$$

Where, TP= True Positive   TP= True Negative   FN= False Negative   FP= False Positive

2. Recall: Recall is the probability that a test will indicate 'test' among those with the matching sample.

$$\textbf{Recall} = TP/ (TP+FN) * 100$$

3. Accuracy: The percentage of the result success out of the whole results is called accuracy. Accuracy is also known as success rate.

$$\textbf{Accuracy = (TP+TN)/(TP+FP+TN+FN)*100}$$

4. Specificity: measures the proportion of negatives which are correctly identified.

$$\textbf{Specificity} = TN/(TN+FP)*100$$

5. Predictive value negative (PVN): is fraction of negative correctly identified by total negative

$$\textbf{PVN} = TN/(TN+FN)*100$$

Table 2: The parametric results obtained from the simulation

PARAMETER	VALUE
Sensitivity or Precision	95.77%
Recall	100.00%
Accuracy	96.25%
Specificity	75%
Predictive value negative	100%

6. Elapsed Time: is defined as measurement of time completing an activity, job or task. In other words, it is defined as difference between finishing time and starting time of the neural network.

$$\textbf{Elapsed Time = Finishing Time – Starting Time.}$$
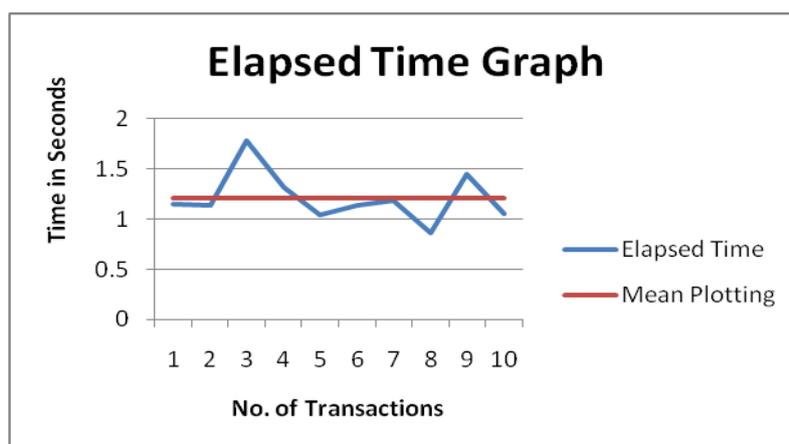
Fig: 3 Elapsed Time Graph for neural Network

Fig 3: shows elapsed time graph of neural network. X-axis represents no of transactions and y-axis represents time in seconds. This graph shows two lines blue and red. Blue line represent elapsed time of neural network .Red line represents mean time

(average time) of elapsed time of the neural network. Some points of elapsed time are greater than average time of neural network and some points of elapsed time are below the average time of neural network.

7. Angular based accuracy of system:
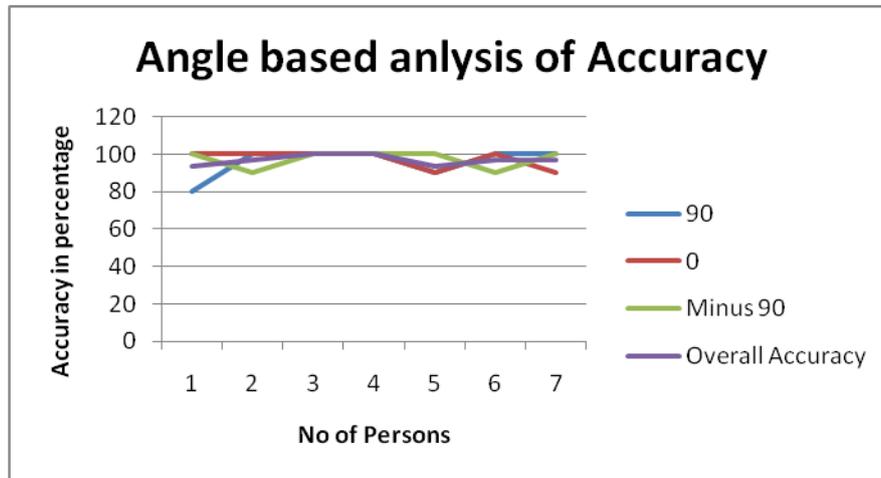
Fig 4: Effect of Orientation to accuracy

Fig 4 shows Angular based analysis of Accuracy graph. The graph is drawn between number of persons in x-axis and accuracy in percentage in y-axis. The graph shows four lines blue color, red color, green and purple color lines. Blue color line represents 90 degree of orientation of accuracy. In 90 degree orientation, accuracy becomes 80% in first case but another cases accuracy rate in either 90 % or 100%. The other two red and green lines represent 0 degree and -90 degree in between accuracy value 90% to 100%.and 90% to 100%.resp. Purple line represents overall accuracy of persons of varying degree.

IV. CONCLUSIONS AND FUTURE WORK

It was found that new system of Face Detection and Recognition provides better accuracy (96.25%) as compared to other existing systems such as Viola Jones algorithm for face detection and ANN for face recognition (87.5%). In future work, Multi-detection and Recognition of new system would be developed. Also new system would be applied on real time application for authentication and security purpose. One more point future scope of this algorithm would be developed for a new algorithm for low resolution images..

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