**Imperial Journal of Interdisciplinary Research (IJIR)**
**Vol-2, Issue-10, 2016**
**ISSN: 2454-1362,** http://www.onlinejournal.in

# A Two Dimensional Video Based Face Recognition Using Artificial Neural Network

Zarinabegam K M[1] & Shridevi K[2]
[1,2]SECAB I E T Vijayapur

***Abstract****: Human faces carry huge and essential information which plays an important role in face detection and recognition. Automatic recognition has various applications in diverse fields. To recognize a face in real time is a challenging problem because pose variation is a major issue. This paper presents a new robust technique for face recognition. A two-dimensional discrete cosine transform which uses an image-based approach towards artificial is used for feature extraction. The unwanted information is discarded and only the relevant data is extracted. A neural network is used to train the database and also for recognition. Two video sequences of a person are captured from a webcam mounted on a computer monitor. Out of which one is for training phase and one is dedicated to testing phase. The video sequences are taken under same illumination condition but with change in facial expression and pose variation. Experimental results carried out prove that the combination of 2dimensional-DCT and artificial neural network tool used for face recognition improves the recognition rate significantly.*

## 1. Introduction

Security is an important aspect in the field of technology. There are various approaches to provide security. One of them is biometrics where thumb impression, iris, face patterns are used. Facial expressions provide huge information and characteristics about the image. Hence these images are applicable in the field of crime detection, to control employee timekeeping, safe transactions, security locks and also to provide security to homeowners. Although technology has grown wider still there is no efficient mechanism available to extract the properties of the images.

There exists a greater challenge for face recognition. The issues are the features that are used to represent the face, changes in perspective, enlightenment, and appearance, an active depiction, the classification of a new face image using the chosen depiction. These require human intervention which consumes more time and is prone to errors. To overcome these problems artificial intelligence system is used.

One of the active areas in the field of artificial intelligence is video face recognition [1]. Different approaches which deal with face recognition such as holistic approach, feature-based approach and hybrid approach. In this paper feature-based approach is used. The image is captured from the webcam, preprocessed and features are extracted and recognition is performed using artificial neural network 2D-Discrete Cosine Transform based algorithm. The section 2 provides details regarding related work. Section 3 gives description of the proposed model. Section 4 provides working of the proposed model. Section 5 gives the implementation details. Section 6 gives experimental results.

## 2. Related work

A review is carried out for the following work.

In [3][4] the image is preprocessed by the means of the genetic algorithm which include acquisition, smoothing, removal of edges , scaling and feature extraction, the images are recognized using Back Propagation neural network. It is robust for poor resolution, variable illumination and different facial looks applied in real time video processing. In [5] the mouth end point and eyeballs are localized, the features are extracted using this data and recognition is performed using Back Propagation Networks (BPN) and Radial Basis Function (RBF) networks. In [6][8] Face recognition using principal Component analysis and neural Networks a database is maintained consisting of different facial patterns of each person. Eigen values acting as features are calculated for stored images and Principal Component Analysis (PCA) and Neural Networks is used for recognition of new images. In [5][7][9] from the video the vigorous information for facial expressions are estimated using Active Appearance Model (AAM) and a Factorization based 3D face reconstruction technique. They also estimate the motion blur using Discrete Cosine Transformation (DCT).

## 3. Proposed System

The proposed approach involves two phases training and testing. The images are captured from the webcam with different poses preprocessing is done, features are extracted and stored in the database for training the ANN. In testing phase the images are captured with respect to variation in pose from the webcam preprocessing is done, features are

extracted and compared with the existing features and classified as recognized or unrecognized using artificial neural network as shown in figure 1.

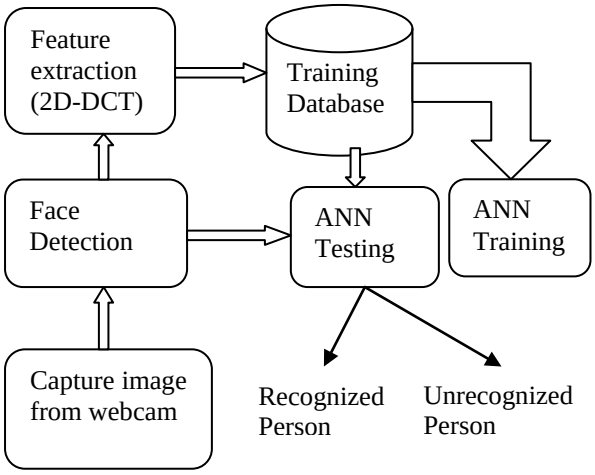


**Figure 1: Proposed System**

## 4. Methodology

The approach involves two stages: training and testing.

*A.* ***Training phase:***

Preprocessing: It involves converting RGB image to binary, minimization of background portion and detection of face object. An RGB image is converted to grayscale using the function 'rgb2gray'. Then the gray scale image is been converted to binary image. Binarization is the process of converting a colored image into a black and white image. The image is traversed from all 4 directions, i.e from top to bottom, bottom to top, left to right and right to left until an image part means a pixel with value 0 is fetched. When 0 is fetched then that point is recoded. In this way the background with a pixel value of 1 is rejected. This process is shown in figure 2.

Face Detection: The face object is detected by considering the connected components using, L = bwlabel(BW,8);

BB = regionprops(L, 'BoundingBox')

The function **'bwlabel'** returns a matrix containing labels for the connected components.

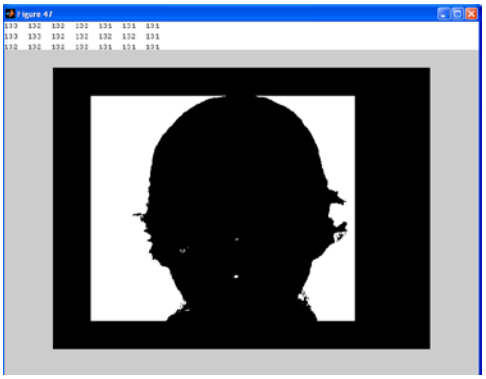

**Figure 2: Binarization of image**

The function **regionprops** (L, 'BoundingBox') measures a set of properties for each labeled region in the label matrix L. Positive integer elements of L correspond to different regions. For example, the set of elements of L equal to 1 corresponds to region 1; the set of elements of L equal to 2 corresponds to region 2; and so on. In the proposed system 8 connected components are considered. A rectangular box is drawn by mentioning the top, bottom, right and left positions. Using Plotbox the rectangular box is plotted which consists of the detected face object as shown in Figure 3.

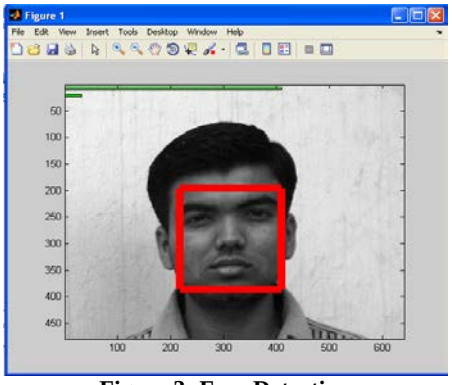


**Figure 3: Face Detection**

Feature Extraction: The features are extracted to locate vectors that contribute for distribution of face images for the given preprocessed image using 2Dimensional Discrete cosine transform (2D-DCT). 2D-Discrete cosine transform is used to find the vectors that best account for distribution of face images within the entire image space. The function dct2 is used to form the discrete cosine transform of the input image. DCT is applied to the entire face object of the preprocessed image. Zigzag scanning is used.

The purpose of zigzag scanning is to

- Map 640*480 to a 1*307200 vector.
- First 35 co-efficients are taken into account that best represent the features.

ANN Training: The training is performed for the images stored in the database using artificial neural network tool.Threshold plays a very important role.

The threshold value in the proposed system is fixed to 0.75.

***B. Testing phase:*** In this process test sample is preprocessed and then features are extracted. These extracted features are evaluated with the set of stored features. If the extracted features of the test sample and the features set of the database matches then the ANN classifies the test sample as recognized person else it is classified as unrecognized person. Threshold is used to classify a test image to the respective class. In the proposed system the threshold value is fixed to 0.75. If the output is greater than 0.75 then the image is classified as recognized person else it is classified as unrecognized person.

## 5. Implementation

The proposed system is implemented using MATLAB software. The image is captured from the webcam using the videoinput method. This method represents the connection between MATLAB and the image acquisition device. The function getsnapshot immediately returns one single image frame.

videoinput ('winvideo', 1, 'RGB24_640x480')

- winvideo is the name of the adapter. Adaptername is a text string that specifies the name of the adaptor used to communicate with the device.
- 1 is the DEVICEID that is a numeric scalar value which identifies a particular device available through the specified adaptor, ADAPTORNAME.
- RGB24_640x480 is the resolution of the device.

The figure 4 shows A graphical user interface for the process of video face recognition.


**Figure 4: Graphical User Interface for the Proposed System**

The image is captured from webcam as shown in figure 5

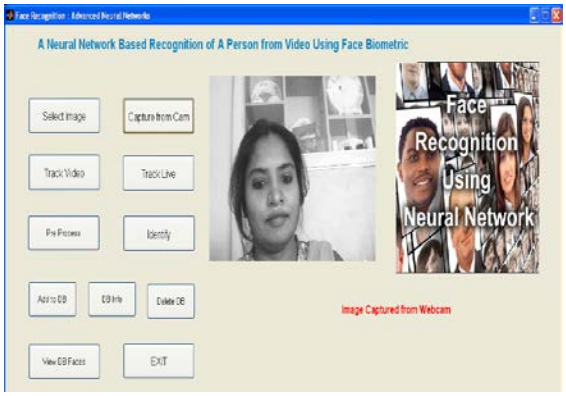


**Figure 5: Image Displayed**

The figure 6 shows a rectangular box where the face object is been detected.

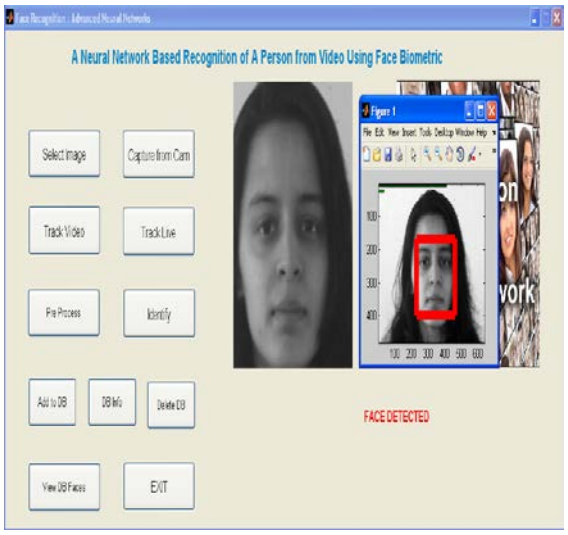


**Figure 6: Face Detected**

Once the features are added to the database with the person's name, a message is displayed and shows that the person is recognized as shown in the figure 7.


**Figure 7: Recognition**

The test image as shown in fig 8 is given to the ANN for testing. The ANN matches the test image with the features saved in the database, if a match is not found then it displays as unrecognized person.

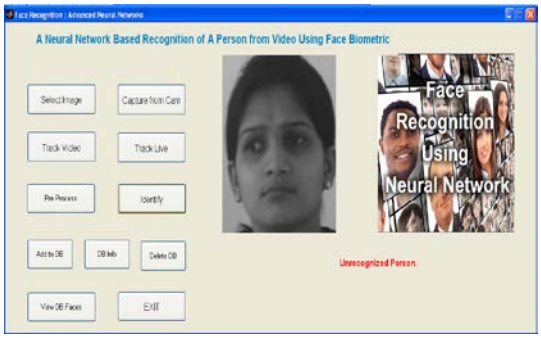


**Figure 8: Unrecognized Person**

## 6. Experimental Results

The below table shows the data set and its efficiency carried out for the proposed system.

**Table 1. Data Set**

| No. of Face images | Recognized Face image | Unrecognized Face image | Efficiency |
|---|---|---|---|
| 5 | 3 | 2 | 60% |
| 10 | 7 | 3 | 70% |
| 15 | 13 | 2 | 87% |
| 20 | 18 | 2 | 90% |
| 25 | 24 | 1 | 95% |
| 30 | 29 | 1 | 97% |

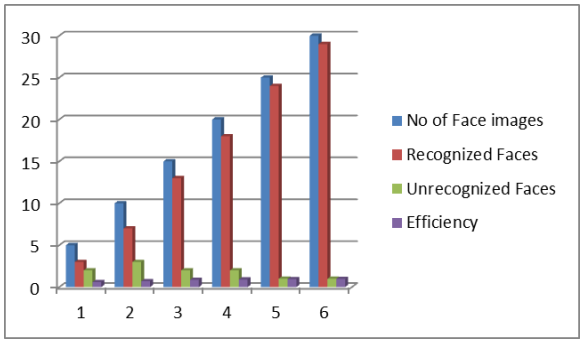


**Figure 8: Efficiency of Recognition**

## 7. Conclusion

In this paper a two dimensional video based face recognition using artificial neural network tool is carried out. It is divided into two phases training and testing. The image is captured from the webcam and features are extracted using 2D-discrete cosine transform. The artificial neural network is used to classify the image as either recognized or unrecognized. The system recognizes the images subjected to change in the pose variation, facial expression. Thus the proposed method is efficient and robust.

## 8. References

[1] *Kian Hamedani, Seyyed Ali Seyyed Salehi, "Video-based Face Recognition Using Manifold Learning by Neural Networks", ICEE 2012.*

[2] M.S.R.S. Prasad1, S.S. Panda2, G. Deepthi3 and V. Anisha, "Face Recognition Using PCA and Feed Forward Neural Networks", *International Journal of Computer Science and Telecommunications Volume 2, Issue 8, November 2011.*

[3] *Mahendra Pratap Panigrahy , Neeraj Kumar, "Face Recognition using Genetic Algorithm and Neural Networks ", International Journal of Computer Applications (0975 – 8887) Volume 55– No.4, October 2012.*

[4] *M.Nandini, P.Bhargavi, G.Raja Sekhar, "Face recognition using neural networks", International Journal of Scientific and Research Publications, Volume 3, Issue 3, March 2013 1 ISSN 2250-3153.*

[5] *A. S. Syed navaz, t. Dhevi sri & pratap mazumder, "face recognition using principal component analysis and neural networks", international journal of computer networking, wireless and mobile communications (ijcnwmc) issn 2250-1568 vol. 3, issue 1, mar 2013, 245-256.*

[6] *Usang Park and Anil k Jain, "Face Recognition in Video: Adaptive Fusion of Multiple Matchers", 1-4244-1180-7/07/25.00 ©2007 IEEE.*

[7] *Gaurav Aggarwal, Amit K. Roy Chowdhury and Rama Chellapp, "A System Identification Approach for Video-based Face Recognition".*

[8] *D. N. Metaxas, S. Venkataraman, and C. Vogler, "Image-Based Stress Recognition Using a Model- Based Dynamic Face Tracking System", International Conference on Computational Science, pp.813-821, 2004.*

[9] *Hyung-Soo Lee, Daijin Kim, "Robust face tracking by integration of two separate trackers: Skin Color and facial shape", Pattern Recognition 40 (2007) ,pp:3225 – 3235.*

[10] *C. Nastar and M. Mitschke, "Real time face recognition using feature combination," s Third IEEE International Conference on Automatic Face and Gesture Recognition. Nara, Japan, 1998, pp. 312-317*