An Efficient Automated Attendance Management System Based on Eigen Face Recognition

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***Abstract*— A Face recognition system is an application of computer vision and image processing which is capable of performing two major tasks of identifying and verifying a person from an image or a video database. The objective of this paper is to automate the attendance s ystem by integrating the face recognition technology using Eigen Face database and PCA algorithm with Matlab GUI. In Conventional attendance system there are several issues like fake attendance, lot of t ime consumption, manipulation of attendance, information cannot be secure. There are many limitations in implementing face recognition technologies like Image Quality, Image Size, Face angle, varying intensity of light. In order to overcome these issues various techniques like Illumination Invariant, Histogram equalization, PCA are used. By using this system attendance is updated automatically after comparing the detected face with original Eigen database in Ex cel sheet i ntegrated with Matlab GUI.**

Keywords—Facial Recognition System,Automated Students Attendance System,Eigen Face Database, Principal Component Analysis(PCA),Matlab GUI

I. INTRODUCTION

Face Recognition technology finds major application in the field of education to efficiently automate and manage the attendance system. As th e number of students enrolling to university increases every year, to maintain the attendance and records of thousands of students is a ma jor concern in the education sector. Therefore in this paper, we discuss an effective system to mark the attendance of students automatically by rec ognizing their faces[1].Face recognition technology finds numerous applications in the fields of automated surveillance, Monitoring closed circuit television(CCTV) to track missing persons and suspected terrorists, Forensic applications, Multimedia applications, Face Reconstruction[2,3,4].There are several challenges involved in trad itional face recognition technology like varying intensity of light , facial expressions, large pose variations, partial occlusions like presence of objects, change of hairstyle or beard, changes in facial features due t o age which impact the face recognition performance[5,6].Developing a efficient model of face detection and recognition is difficult ,because they are very complex and has multidimensional view.

II. PRINCIPAL COMPONENT ANALYSIS (PCA)

Principal Component Analysis is used as dimension reducing technique to analyze face recognition issues. It is also known as Eigen Face Projection. The face database images are converted to multivariate data set [7, 8]. By means of data compression PCA technique reduces dimension of data and shows the most effective low dimensional structure of fa cial features. This dimensional reduction discards information which is not useful and precisely decomposes the face structure components into orthogonal (uncorrelated) components known as Eigen faces [7].

A face contains certain set of important features and these characteristic features are called principal components or Eigen faces. By implementing PCA technique facial features are extracted from orig inal database [9].PCA finds major applications in fields of image analysis, recognizing unkown faces, and dimensional data reduction. Major applications for which the PCA is mor e useful is the minimum dimensional representation for all original database images. A test image is compared with training images by calculating the distance between the feature vectors. The P CA approach requires the full frontal image of face to be presented each time, otherwise the image results in poor performance. From the data acquired, the PCA technique can be used to reduce the data to dimensionality of training set [8, 9].

ALGORITHM

Step 1: Prepare training set database with NXN resolution.

Step 2: Convert the images into a column vector.

Step 3: To find unique features normalize the vector.

Step 4: Calculate Average face vector.

Step 5: Calculate co-variance matrix to find Eigen vectors.

Step 6: Select ‘K’ best Eigen faces based on facial pattern.

Step 7: Each database image is represented as a combination of all ‘K’ Eigen Vectors.

Step 8: Each Training database image is represented as weighted vectors.

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III. PROPOSED METHODOLOGY

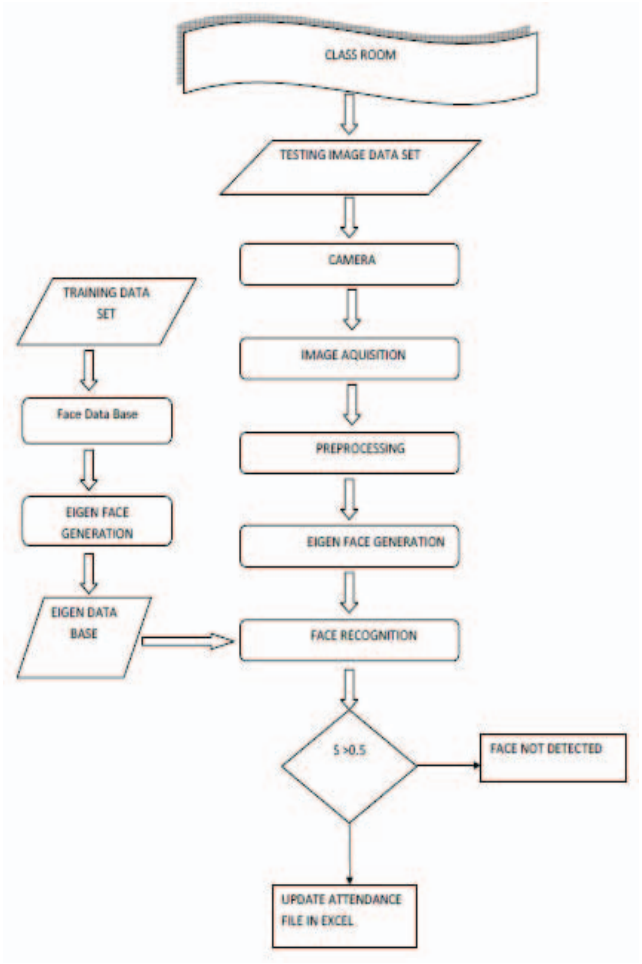

Fig. 1.Proposed Automated Attendance Architecture

PROPOSED SYSTEM'S ARCHITECTURE:

A) Image Acquisition
B) Pre-processing
C) Eigen Face Generation
D) Face Recognition
E) Face Data Base Generation
F) Automated Attendance Marking

A. Image Acquisition

Images of students in a class are acquired using high end web cameras offering 1280x720 resolution.After capturing using web services transfers the image on server for processing.

B. Pre-Processing

Image Cropping-Region of Interest is cropped from acquired image.

Image Resize-The cropped images are resized to 48x64 pixels for face recognition.

Resized images are converted from RGB to Gray level.

Image Enhancement-To improve the contrast of the image histogram equalization technique is used [10, 11].

C. Eigen Face Generation

To generate Eigen face database, large number of digitized images are normalized. Then it is resample to same pixel resolution.Eigenfaces are used for data compression of faces for identification purpose[12,13,14].In our proposed system Eigen face is generated for training set images and Test images.12 best Eigen faces are selected for our study.

D. Face Recognition

Face recognition is the next step after face detection. First the image is cropped to the region of interest and comparing them to enrolled images in the face database. For the face recognition, the faces are verified one by one using the Eigen Face method[15,16].

E. Face Database Generation

Original Face Database consists of images with 15 different persons with 10 images per person. Size of each image is 48 x 64 pixels. Fig 2. shows sample images of some of the persons from our face database. With change in intensity of light and various facial expressions the original database images are acquired at various intervals of time.

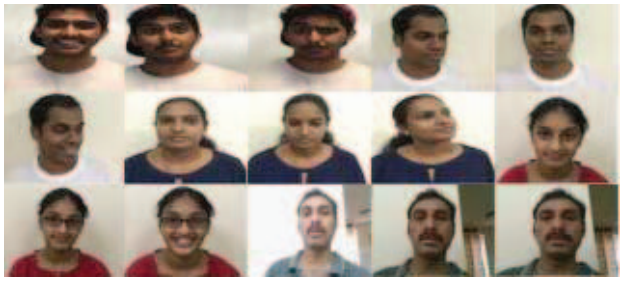

Fig. 2. Database Sample Images

F. Automated Attendance Marking

After the verification of faces and successful recognition is done, the attendance will be automatically marked for eac h person on Microsoft Excel sheet integrated with Matlab GUI.

Fig. 3. Eigen Face Database

IV. Results and Discussion

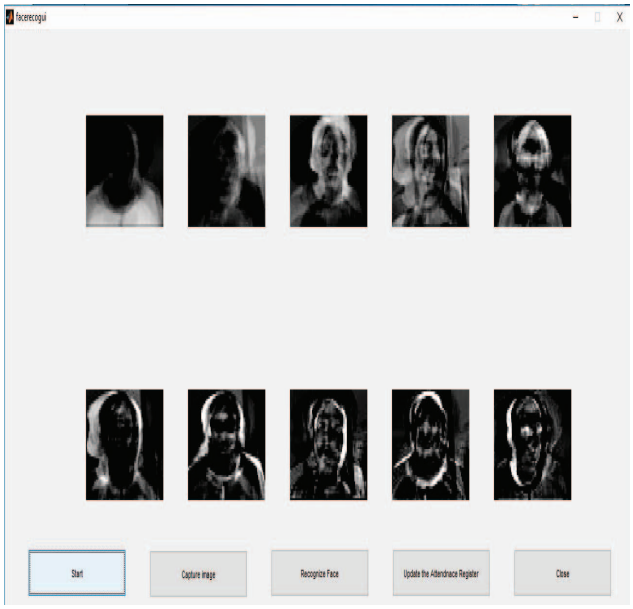

Fig.4. Screen shot of Matlab Graphical User Interface

Screen shot with Matlab GUI describes the following ,

Start-Face database is loaded to workspace in Matlab GUI,also generates Eigen faces for complete training set.

Capture Image-Test Image is captured which is subjected to various preprocessing techniques.

Recognize Face-Eigen face of test image is compared with Eigen face training image using Euclidean distance.

Update the attendance register-After face recognition attendance is automatically updated in Microsoft Excel sheet. If face is not recognized attendance is not updated.

RESULT

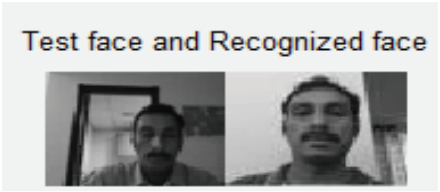

Fig. 4.Test Face and Recognized face

Test face and rec ognized face is matching with similarity score equal to 0.4.If similarity score is less than threshold value of 0.3 then face is not recognized.

V. Conclusion

To build a secure environment is a primary cause of concern in today's scenario and Facial recognition system helps in achieving it. Among all the biometric techniques, Facial recognition technology has great advantage in field of education as it can be u sed to update and manage the attendance automatically in a secured way when compared to traditional methods.

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