ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 3, Issue 8, August 2016

Design and Implementation of Camera Based Classroom Attendance System

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***Abstract:* -- The face is one of the unique identity of a person. Image processing techniques are widely used nowadays to exploit this physical feature of a person. The attendance is taken in every schools, colleges and library. Traditional approach for attendance is professor calls student name and record attendance, which results in wastage of time. For each lecture this is wastage of time. To avoid this, we propose an automatic process which is based on image processing. The proposed system is based on face detection and recognition. The face detection differentiates faces from non-faces and is therefore essential for accurate attendance. The other approach involves face detection and recognition for marking the students attendance. The proposed system provides an efficient way to record and manage the attendance activity in a university/institution. The proposed system stores the details of each student as well as their facial features in the database and it compares the new patterns with the previously stored patterns as per the requirement.**

***Keywords*: Viola Jones algorithm, image processing, Eigenface ,PCA, Matlab.**

I. INTRODUCTION

Nowadays, taking attendance in any field is very important task to maintain the record of students, employees etc. Traditionally, student attendance is taken manually by the respective subject teacher which is very time consuming. We observed that the technique used was very time consuming. The face detection and face recognition are very advanced in terms of computer authentication technology. The technology of student attendance system is used to support the teacher for checking student attendance in modern way. It is gradually evolving to a universal biometric solution since it requires virtually zero effort from the user end while compared with other biometric options. The system is going to work by some techniques such as the picture is taken by camera then processed towards the detection as the detected face image is obtained face recognition has to be done which is divided into further parts namely face alignment, preprocessing, feature extraction, face matching where the image is converted into gray scale image and the result has to be seen. This has been done by using PCA algorithm. This technique is considered to be one of the most successful for image processing or analysis. Face recognition is a biometric method for identifying any individual by the features of their face. Applications of face detection are widely used in areas such as security systems, criminal identification etc. Using a pre-stored database, wecan identify one or more identities in the scene. The general block diagram of our proposed system consists of three blocks.the first is the face detection, the second is feature extraction,and the third is face recognition shown in fig.1.

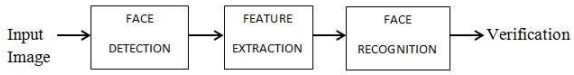

Fig. 1. General block diagram

II. METHODOLOGY

For the proposed system we are using a two-step mechanism. First comes to be face detection then followed by face recognition. For face detection we are using viola jones face detection algorithm while for face recognition we have used principal component analysis (PCA).

A. Viola-jonesalgorithm

There are three major blocks in viola-jones algorithm; integral images, ada-boost algorithm and attentional cascade. The integral image computes a value at each pixel for example (x,y) that is the sum of the pixel values above to the left of (x,y). This is quickly computed in one pass through the image. Viola jones

ISSN (Online) 2394-6849
International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
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algorithm uses haar like features. This is nothing but scalar product between the image some haar like structures. Feature is selected through adaboost. Ada-boost provides an effective learning algorithm and strong bounds on generalization performance. The overall form of the detection process is that of a degenerate decision tree, what we call a cascade. A positive result from the first classifier triggers the evaluation of a second classifier which has also been adjusted to achieve very high detection rates. A positive result from the second classifier triggers a third classifier, and so on. A negative outcome at any point leads to the immediate rejection of the sub-window. The cascade training process involves two types of tradeoffs. In most cases classifiers with more features will achieve higher detection rates and lower false positive rates. At the same time classifiers with more features require more time to compute. In principle one can use following stages.

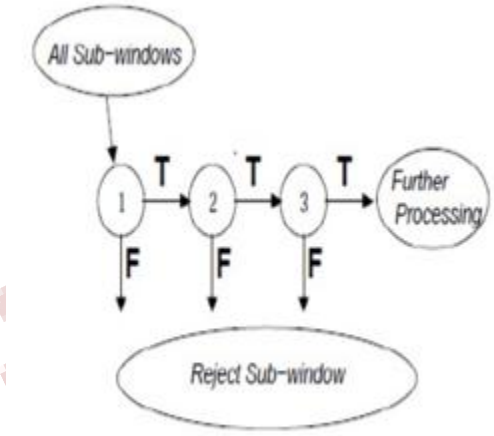

Fig. 2. Cascade classifier

I) the number of classifier stages, ii) the number of features in each stage, and iii) the threshold of each stage, are traded off in order to minimize the expected number of evaluated features. Unfortunately finding this optimum is a tremendously difficult problem. In practice a very simple framework is used to produce an effective classifier which is highly efficient. Each stage in the cascade reduces the false positive rate and decreases the detection rate. A target is selected for the minimum reduction in false positives and the maximum decrease in detection. Each stage is trained by adding features until the target detection and false positives rates are met these rates are determined by testing the detector on a validation set. Stages are added until the overall target for false positive and detection rate ismet

B. Flowchart

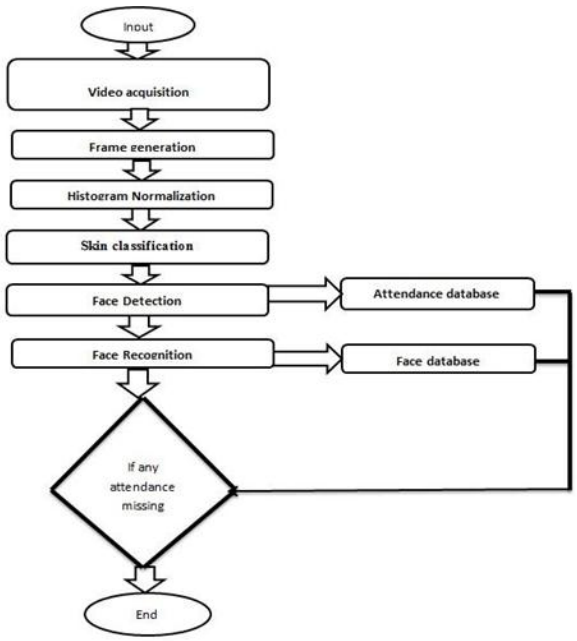

Fig. 3. Face detection & recognition

The flowchart is shown in fig.3

1) Video acquisition: video is acquired from a camera such that all the student faces to the camera. This camera is connected to the computer and sends these video to the computer forprocessing.

2) Frame generation *:*after inputting the video to the computer, frame generation is first performed by dynamic frame generation ofvideo.

3) Histogram normalization*:* captured image sometimes have brightness or darkness in it which should be removed for good results. First the rgb image is converted to the gray scale image for enhancement. Histogram normalization is good technique for contrast enhancement in the spatial

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domain.

4) Skin classification: this is used to increase the efficiency of the face detection algorithm. Voila and jones algorithm is used for detection.. The images of faces and then applied on the class room image for detection of multiple faces in the image.

5) Face detection: haar classifiers have been used for detection. Initially face detection algorithm was tested on variety of images with different face positions and lighting conditions and then algorithm was applied to detect faces in real time video. Algorithm is trained for the images of faces and then applied on the class room image for detection of multiple faces in the image.

6) Face recognition and attendance: after the face detection step the next is face recognition. This can be achieved by cropping the first detected face from the image and compare it with the database. This is called the selection of region of interest. In this way faces of students are verified one by one with the face database using the eigen face method and attendance is marked.

1) Principal component analysis (PCA)

Principal component analysis (PCA) algorithm is used to recognize the faces in the image. It is mathematically defined as an orthogonal linear transformation that transforms the data to a new coordinate system. It involves the procedure that transforms the number of possibly correlated variables called principal components. It involves the calculation of the eigen value decomposition of a data covariance matrix or singular value decomposition of a data matrix, after mean centering the data for each attribute. The results of PCA are in terms of component scores and loading. PCA is theoretically the optimal linear scheme for compressing a set of high dimensional vectors into a set of lower dimensional vectors and then reconstructing the original sets.

PCA algorithm is as follows:

- A data matrix (m x n) for each image is created which is then convert edintoanm*nx1matrixhavingrowsEqual to the product of number of rows and columns of the original matrix.
- A mean matrix is created for all the different image matrices. The mean matrix is calculated by adding all the columns of data matrix divided by the total number of columns.
- The mean subtracted data matrix is obtained by subtracting the mean image from all the image matrices.
- The covariance matrix is obtained by multiplying the mean subtracted matrix by its transpose to make it a square matrix in next phase.
- The system then finds the eigen vectors and eigen values. For n dimensional vectors there will be n eigen values and eigenvectors.
- Then the eigen image is created by multiplying mean subtracted data matrix with the eigen vectors.
- Eigen vectors with highest eigen value is the principal component of the data set having maximum information.
- The weight matrix is then calculated by multiplying the transposed large eigen image with the mean subtracted datamatrix.
- After these steps the system can recognize any face image by comparing it with the main weight matrix.

III. RESULTS

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Fig. 4. Captured video frame

Fig. 5. Extracted faces

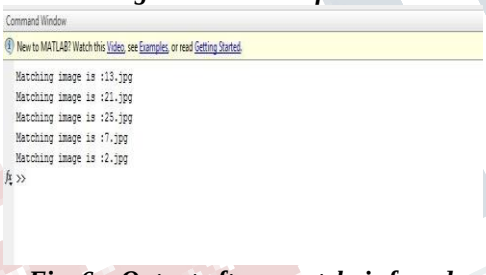

Fig. 6. Output after a match is found

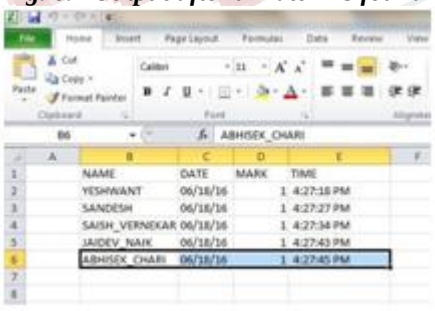

Fig. 7. Marking of attendance in the excel sheet

Fig. 8. Gui for the system

IV. CONCLUSION

Principle component analysis (PCA) for face recognition shows that increase in the number of eigen value will increase the recognition rate. However, the recognition rate saturatesafter a certain amount of increase in the eigen value. Increasing the number of images and variety of sample images in the covariance matrix increases the recognition rate howevernoisy image decrease the recognition accuracy. In general, theimage size is not important for a PCA based face recognition system. Expression and pose have minimal effect to the recognition rate while illumination has great impact on the recognition accuracy. Finally the attendance is marked on microsoft excel sheet based on the recognized face image.

V. FUTURE SCOPE

In the future work, we can develop advanced program, so some important information of the student can be stored, and can be send to the parents. And forthe matching images the background should be plane, proper lightning should be there, can work on these problems. The current recognition system has been designed for frontal views of face images. A neural network architecture (may be together with a feature based approach) can be implemented in which the orientation of the face is first determined, and then the mostsuitable recognition method is selected. Further future work can be extended to build a system, which can deal with large rotation it seems necessary to train a set of classifiers on adatabaseofrotated faces with each classifier being tuned to specific range of rotation. A system for face detection must be developed, which can give more accurate results in terms of right hit rate, repeat rate, false hit rate, average accuracy and average run time. The goal of any future improvement should be to improve the detection rate, minimize the number of false positive, and improve the speed of the

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detection process. A good place to start would be to aim to minimize the number of false positives.

For security reasons, we can use detection recognition system. To identify culprits on bus stations, railway stations 7 other public places, we can use this system. This will be helping hand to the police. In this system, we will use gsm module. Suppose if culprit is detected, then detectedsignalcanbe transmitted using gsm module to the central control room of police station. With the help of isdn number of gsm, culprit surviving area will be recognized.

REFERENCES

[1] balwant singh, sunil kumar, paurush bhulania,"lecture attendance system with face recognition and image processing, ijarse, vol. No.2,issue no.3, march, 2013

[2] nirmalya kar, mrinal kanti debbarma, ashim saha, and dwijen rudra pal, study of implementing automated attendance system using face recognition technique, international journal of computer and communication engineering, vol. 1, no. 2,pp. 100-103, july 2012

[3] poonam dhankhar, nneha sahu,edge based human face detection using mat- lab,cse itm university gurgaon-haryana, pp. 58-60

[4] praveen kumar, pushpendra kumar, rajeev kumar, sunil kumar, nitin kathuria, face recognition based on edge detection algorithm using matlab ijarse, vol. No.2, issue no.5,pp.12-15 ,may 2013

[5] jeba baig , payal bharne and tarun chauhan,automated attendance monitoring system using face recognition vol.2, special issue- 1,pp.108-112 ,march-2015

[6] jomon joseph, k. P. Zacharia, automatic attendance management sys- tem using face recognition , ijsr vol 2 issue 11,pp.327-330, november 2013

[7] liton chandra paul , abdulla al sumam, electronics and telecommunication engineering, rajshahi university of engineering and technology, "face recognition using principal component analysis method", vol.1 issue 9 pp.135-139,nov 2012