FACE RECOGNITION BASED ATTENDANCE SYSTEM USINGPCA

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Abstract

There are many algorithms to detect and recognize the multiple faces in the visible boundaries but to recognize the multiple faces in real time is quite challenging. Focusing on this challenge, we propose a principal component analysis (PCA) algorithm, which is a robust and high performance recognition and feature extraction technique. Using this algorithm, we proposed a face recognition based attendance system using PCA. Here N number of faces is detected and recognized from the video camera and automatically enters the attendance in the student attendance management system. The admin can login to the database and modify the student data if he/she wants to add or delete the data. In the proposed system we recognize already stored image, real time capturing image, already stored video and real time capturing image. So the performance and accuracy of the system is very challenging compared to existing systems. The error rate of an proposed system is less than 0.099%.

Keywords- *Face Recognition, Weighted Vectors, Reduced Dimensionality, Attendance database.*

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1. INTRODUCTION

Face recognition is a biometric application technique. This biometric recognition technique has been studied from a eras but correct and effective way of recognizing the multiple faces have not been offered until now. We proposed a face recognition based attendance system using PCA algorithm. This PCA algorithm is a best feature extraction and classification scheme.

The primary goal is to develop an automatic face recognition algorithm that helps us for security in all regions like school, college, hospital, law enforcement, police, shops, public places like cinema hall, malls, bank, bus stand, airport, etc.

In the proposed system, first we keep the training sets, which are the many positions of the same persons with 'n' number of people's faces in it. After storing these training sets in the database or some files we need to convert the training sets into an eigenvectors.

The camera which is implemented in the class room takes or captures the images or videos in the frame and detect these frame for each of the faces.

Once the faces of different people is detected, these faces are converted into an eigenfaces and weigh are given for each faces. If the weigh is less than that of threshold then that person is present else it is an unknown person.

After when the person is identifies whether he or she is known or unknown, that student detail is automatically updated in the student database.

In the proposed system the database which we use is very efficient and accurate. The administrator can login to the system with the unique username and password. If the username or password is incorrect or not matching, the administrator cannot login to the System. Only an administrator can modify an attendance system, which means the administrator have and access permission to delete and add the student details in the database.

The user does not have an access permission to delete or add a student details which makes an attendance system very efficient and non hackable. . PCA does not work directly by the training set, the training set has to be converted into a vector form. These vector will be of dimension N^2 rows and N^2 columns. The converted face vector is kept in the form of face vector space. The converted face vector is then normalized ϕ, for that we calculate average face vector, which is all the common faces in the training set is removed.

In the proposed system we gave recognition for four medias:
1. Existing images
2. Real time images
3. Existing videos
4. Real time capturing videos

We also added the student name above their face when the camera detects that particular face, which makes the user confidentiality that the particular face is really in the training data sets.

Below figure 1 shows that the overall view of the proposed system from the starting stage to the updating of the attendance system.

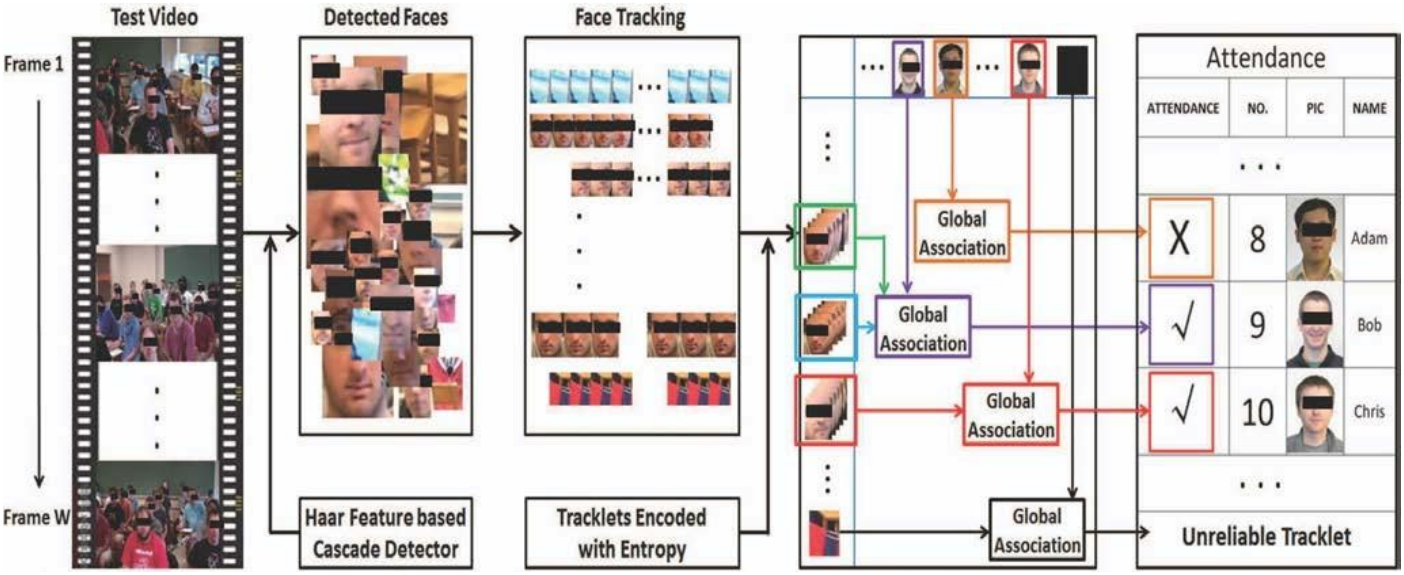

Fig 1: Face recognition and attendance system overview

2. FACE DETECTION AND RECOGNITION

Before Recognizing the faces we need A training sets consisting of total M images let's consider 100 in the datasets. Each of these images will be of size N*N. Let us consider it 50, so 50*50 will be 2500 pixels and dimensions.

After when we create a training set, we recognize the training set. PCA does not work directly by the training set, the training set has to be converted into a vector form. These vector will be of dimension N^2 rows and N^2 columns. The converted face vector is kept in the form of face vector space. The converted face vector is then normalized ϕ, for that we calculate average face vector, which is all the common faces in the training set is removed. That is only the unique features are selected, this is done by subtracting the average face vector from each face vector. Then we calculate the Eigenvector, to calculate the eigenvector, we need to calculate the covariance matrix C.

$C=A.A^T$ where $A=\{\phi 1, \phi 2 \ldots\ldots .. \phi m\}$

Where A is going to be of $N^2 * M$

So,

$C= A. A^T$

$C = N^2 * M \; M * N^2$

Here in the above equation, by an linear algebra it will become $N^2 * N^2$

This is very huge matrix. For example N is 50, that means the matrix will be 2500*2500

Covariance Matrix:

To find K Eigenvectors from 2500 eigenvectors, it's huge and time consuming. So we reduce the dimensionality. To reduce the calculations and effect of noise on the needed eigenvectors, calculate them from a covariance matrix of REDUCED DIMENSIONALITY!

$C=A^T A$

$C=M*N^2 \; . \; N2*M$

C=M*M

which will becomes a less eigenvectors to calculate the K eigenvectors. Select the K best eigenvectors, such that k<M and represent the whole training set.

Each face in the training set can represented a weighted sum of the K Eigenfaces+the Mean face.

The mean face has a K linear eigenvectors with the weigh w1, w2……..

where the weigh vectors are

W1
Ω=W2
W3

WK

A weigh vector Ω, which is the Eigen face representation of the ith face, weigh vector for each face is calculated as shown in the Fig 2.

3. RESULTS AND DISCUSSION

Principle components analysis is an efficient and effective algorithm that can able to perform recognition comparing with already evolved methods such are 3D facial features recognition, Discrete cosine transformation, and bunch bounding technique etc..

Experience behind selecting face detection and recognition is by considering processing speed, correctness, periodical boundaries and obtainability by considering these, selected PCA method for face recognition whereas that contains

- Calmest result to apply.
- Enormously firm for computing.
- Precise result.

There are many cons in PCA using algorithm is that:

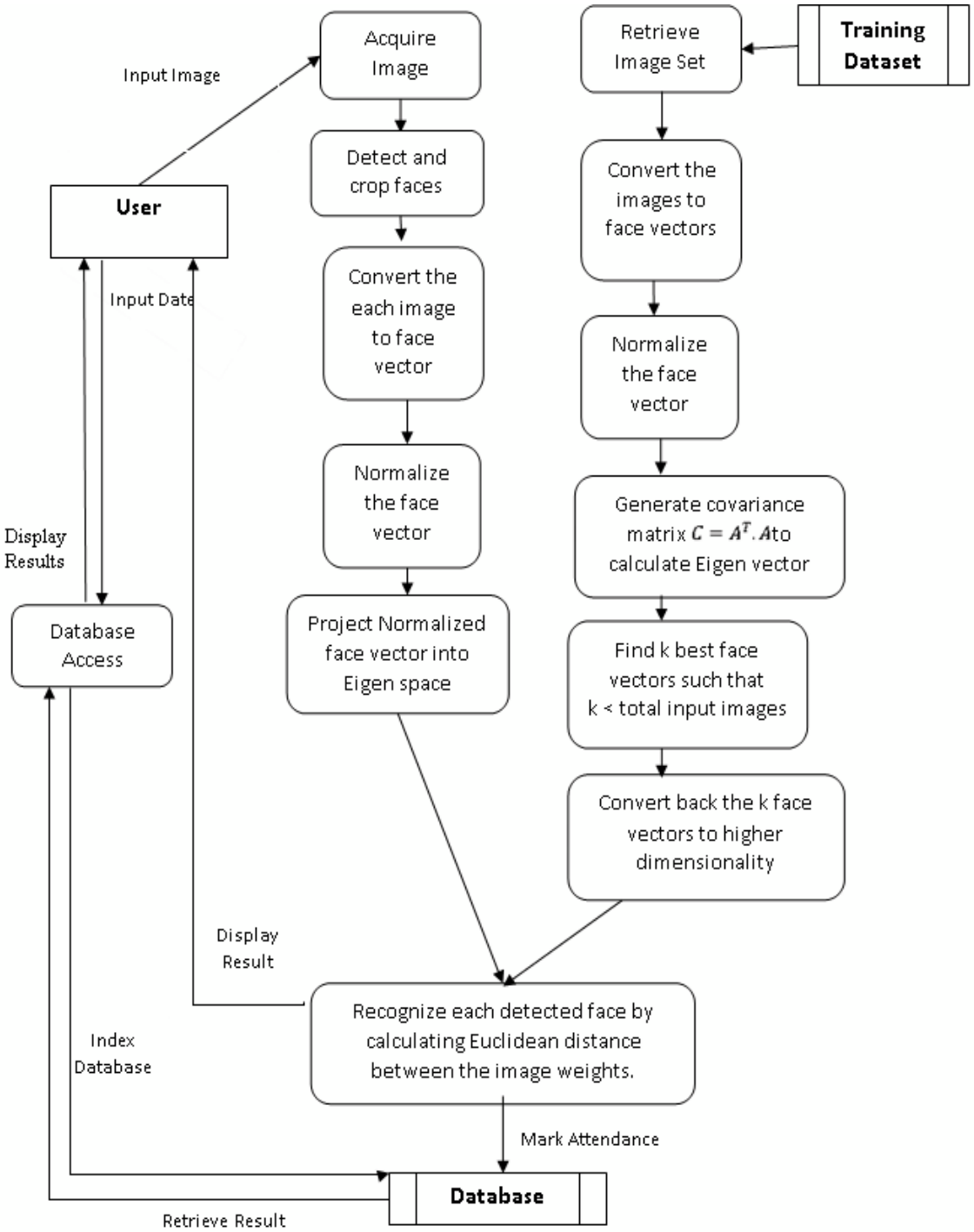

Fig 2: PCA interaction between recognition and attendance system

- Lighting effect in image.
- Conversion variants.
- Contextual difference.
- Measurement miss.

3.1 Technique of PCA

Principle components and analysis uses Eigen face method it's one of the generally using algorithm for face recognition. In these method dimensionality reduction can be performed easily for detection and recognition of face image from different image sets. Here actually it applies mathematically function to convert into Eigen vector. These faces can estimated by using large eigenvalues that will quantify the variation between multiple faces. The best M Eigen faces define an M dimensional space, which is called as the 'face space'. Eigenfaces is experimental approach for face recognition. Because it's efficient in processing time and precise results. Also has high correlation between the training data and recognition of the data. Since accuracy of Eigen face is depended on the light intensity because use pixel information for comparison for projection, so accuracy may decrease with light variations.

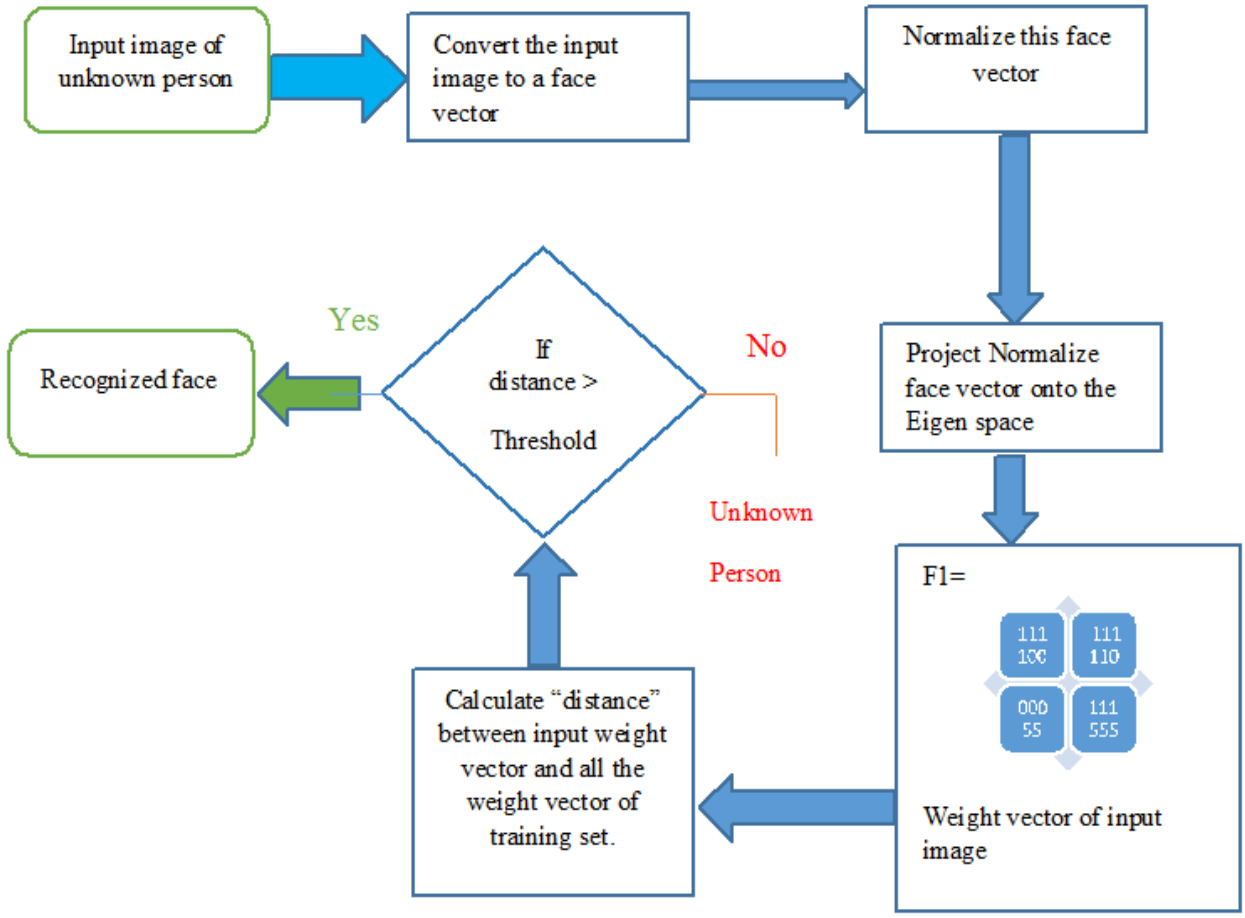

Fig 3: PCA Workflow

The idea of PCA can be described in following steps:
1. Create training sets
2. Convert trainjing sets to eigenvectors
3. Normalize the eigenvectors
4. Use reduction dimensionality
5. Find K eigenvector
6. Compare K eigenvector with training set mean face
7. Find face as known or unknown

The work flow of the Principal component analysis method is shown in the colorful figure 3.

Calculate the distance between the input weigh vector and all the weigh vector of the training set.

If distance is greater than threshold, thee face is recognized else it is an unknown face.

The input image of unknown face can be identified easily in the proposed system.

4. CONCLUSION AND FUTURE ENHANCEMENT

We are trying to solve various unsolved face recognition issues. Distance has a large influence on face recognition results due to this problem we fix the distance for capturing a face image different viewing angle at different distances.

Face logon provides identification of a user by biometric verification. Passwords and fingerprints are past now, apply password every time you login to your PC, or mobile is now past face recognition is the future login.

The main drawback of PCA algorithm is a lightning and illumination, so the persons face position has to be in the same position in the training set. These problem can be solved in future.

Further in the proposed system we are trying to develop an android or any platform application, so that the admin can login to the system from anywhere.

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