

Computerized Attendance System Using Face Recognition

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Abstract - In this paper we have proposed an attendance system using face recognition for educational institutions/schools and organizations by making use of Open Computer Vision(OpenCV) with help of certain Face Recognition and Face detection algorithms. In the era of automation, by replacing the traditional/manual way of attendance marking system the automated attendance system will take the helm. In this project, face databases will be created to help the recognizer algorithm. Then, during the tracking session, faces will be compared against the database to seek for identity. When an individual is identified, its attendance will be marked automatically saving necessary information into the excel file. As compared to the senile attendance marking system which is much of an arduous task, by means of technology this project will provide huge convenience to the authority as many processes are automated here.

KeyWords: Principle Component Analysis (PCA), Haar-Features, Viola-Jones Algorithm, Eigen Faces.

1. INTRODUCTION

Class attendance is very important aspect for students studying in any educational institutions. So it is very important to mark the attendance accurately and effectively. In the modern era of technology still in many organizations attendance is marked manually by the faculties which is a quite tedious task, this senile way of attendance marking by calling name or roll no. of students is not only time consuming but also results in inaccuracy, forging and also lots of resources are wasted. An automated face recognition attendance system will be quite useful to eradicate all the problems faced by the traditional way of attendance marking system. There are other ways like RFID card and fingerprint scanner for attendance marking which is used by many institutions although they are automated and way ahead of traditional method but fails to meet the time constraint. This project introduces an involuntary attendance system which does not require any physical interference. Facial Recognition System is an list intrusive and fastest biometric technology that can uniquely identify a person based on the

persons facial textures and shape. The recognition process uses biometrics for mapping of facial features from a video or photograph. The captured information is compared with a database of known faces to find a best match and the resulting result is stored in a spreadsheet with desired individual information.

2. ALGORITHMS

A. VIOLA JONES FACE DETECTION ALGORITHM

It was the first algorithm used by the computer vision to detect the objects in real time. However it was mostly used for the detection of faces. To detect the faces the algorithm uses four stages.

❖ Haar feature selection

All human faces have some similar properties such as the nose region is bright as compared to eyes and also the eye region is darker as compared to cheeks.

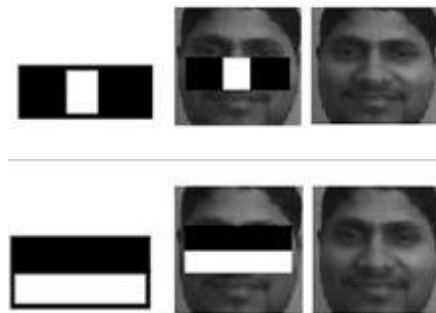


Fig -1: Haar features similar to human face

The value of the rectangular Haar features can be given by, Value= (sum of pixels in black area)-(sum of pixels in white area)

❖ Integral image

An integral image of a given subwindow is created to reduce the complexities while comparing them with the haar features to detect whether the given subwindow contains a face or not.

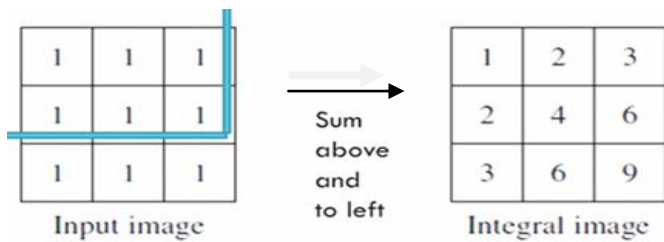


Fig -1: conversion of input image into an integral image

The integral image of a given sub-window is calculated at each pixel by adding the values of the pixels at right and above that pixel.

❖ Adaboost training

There can be approximately 160000+ feature values within a detector of 24X24 image window. Adaboost is a machine learning algorithm which helps in finding only the best features among these detected features.

In this step the trainer converts the weak classifiers into a strong classifier by the linear combination of weak classifiers.

$$F(x) = \alpha_1 f_1(x) + \alpha_2 f_2(x) + \alpha_3 f_3(x) + \dots$$

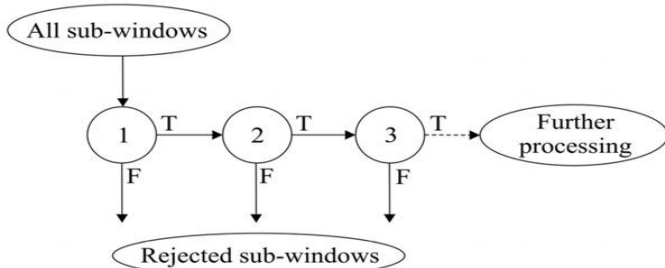
Where, $F(x)$ = strong classifier

$f_1(x), f_2(x), \dots$ = weak classifiers

This training helps us to detect faces with ease.

❖ Cascade classifier

In order to reduce the processing time to detect the faces in a given video frame we make use of cascade classifier. In this we add some important Haars face features in each of the classifier. When the image sub windows pass through each classifier only the sub windows containing faces would be passed to the next classifier to detect faces in the sub window. Hence increasing the efficiency of detection of faces and reducing the false face detection rate.



Here several classifiers are cascaded as our system will also work on a low power CPU. The classifiers help us in eradication of unwanted parts of images. Cascading classifiers are pre trained for the detection of particular object. For successful detection of desired object entire frame is scanned and object is detected. If we take a look at any input image the most part

of it is inefficacious which is nothing but the non-face region. After completion of adaboost part we have n number of features so applying this features on the ineffectual part of image will be time consuming. So a better idea will be to check if a window contains the face region or not. Here the grouping of features is done in all different stages of classifier which helps us in eradication of the redundant parts of image.

B. PRINCIPAL COMPONENT ANALYSIS ALGORITHM

Multivariate Analysis is used for data involving a large number of correlated variables. Principal Component Analysis is a dimension-reduction technique used to reduce a large number of variables to a small number of variables that still contains most of the information in the large set. Principal component analysis is a mathematical procedure that converts a number of correlated variables into number of uncorrelated variables which are called principal components. The first principal component contains as much of the variability in the data as possible, and each succeeding component accounts for as much of the remaining variability as possible.

❖ Eigenfaces

Eigenfaces a set of eigenvectors when they are used in the computer vision problem of human face recognition. A set of eigenfaces are created by doing a mathematical process called principal component analysis on a large number of images depicting different human faces. Informally, eigenfaces can be considered a set of "unique face ingredients", derived from statistical analysis of many images of faces. Any human face can be considered to be a combination of these standardized faces. For example, one's face might be composed of the average face plus 15% from eigenface 1, 65% from eigenface 2, and even -2% from eigenface 3.

3. METHODOLOGY

Below is the block diagram of the system for efficient understanding of our project. The introduced system comprises of web cam which is used while capturing images. For purpose of registration we have to manually enter the roll number or unique id for that person with person's name this step should be done under the guidance of any faculty member to avoid any ambiguity. From the camera the input images are captured and faces in them are detected. We make use of viola jones algorithm for detection of faces. After

successful detection faces are trained. For training of detected images we make use of principle component analysis same as eigen face recognition algorithm. For better results and accuracy we have to capture many images of same person with different expressions which results in training efficiency. Further all different images undergoes same procedure as mentioned above and are stored in a database. After successful completion of above steps an xml file is generated which includes set of HAAR features extracted during the training process. As the training process is completed the system is ready for recognition and marking of attendance. Now, as soon as a face is detected the system compares it with the trained faces stored in the database and if matching results are obtained, attendance is marked in the spreadsheet for that specific recognized person with current date and time.

3.1 GUI

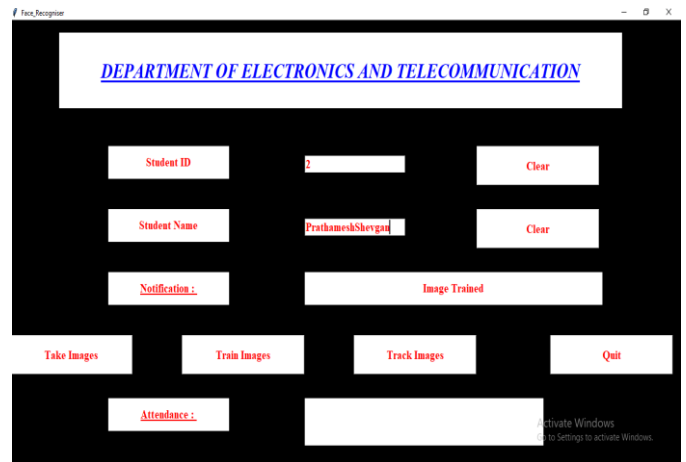


Fig -1: Graphical User Interface

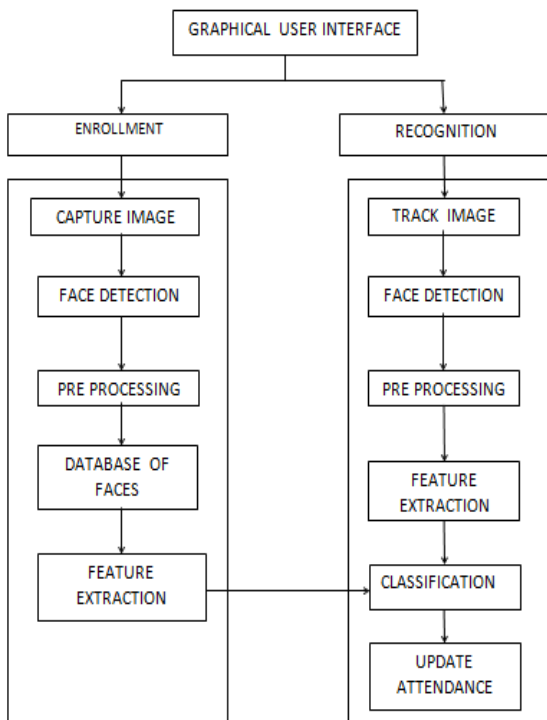


Chart -1: Flow chart
(Attendance updation procedure)

3.2 IMAGE ACQUISITION

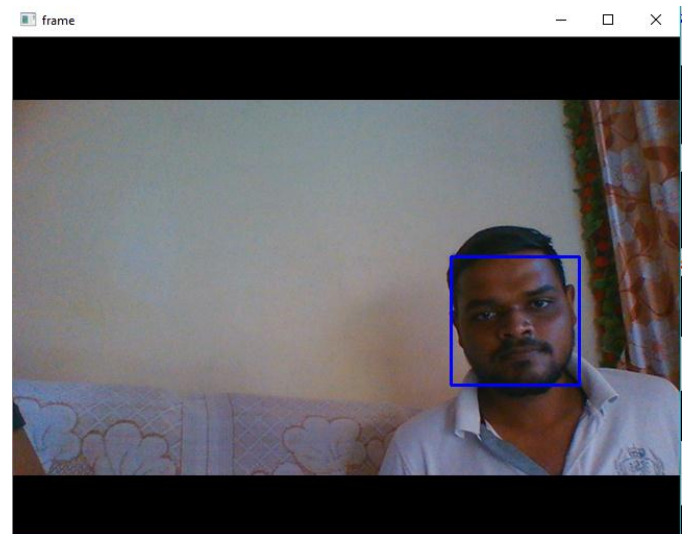


Fig -2: Image Acquisition

Capturing image as an input through camera as seen in the above figure complete face is detected.

3.3 DATABASE

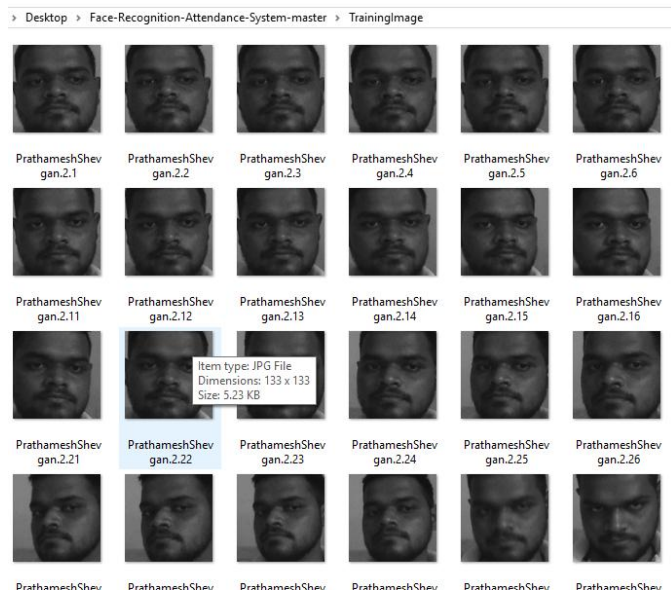


Fig -3: Database

In above figure set of trained images from the database are shown. After detecting a face, it is stored in database. Database is created for extracting features for face recognition.

3.4 FACE RECOGNITION

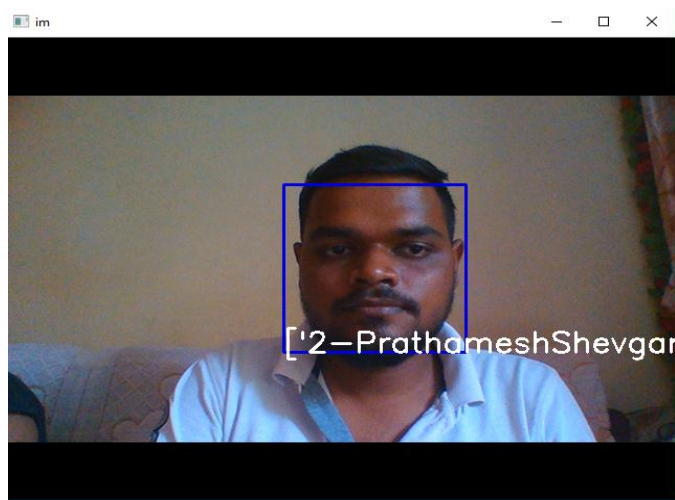
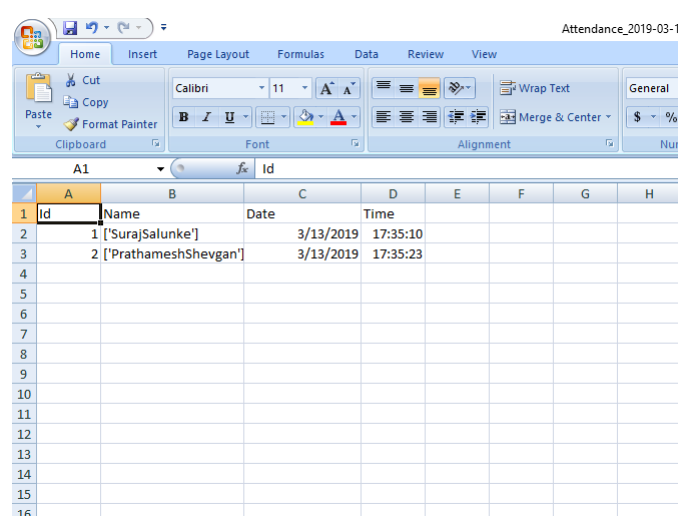


Fig -4: Image Recognition

In above figure the image is detected and recognized as the ID and Name of person is displayed. It is done by comparing features of faces from database and current detected face. Principal Component Analysis algorithm compares features by determining distance between features of faces.

3.4 UPDATION OF ATTENDANCE



Id	Name	Date	Time
1	['SurajSalunke']	3/13/2019	17:35:10
2	['PrathameshShevgan']	3/13/2019	17:35:23

Fig -5: Student Attendance table design view.

The above figure is showing the records of the students whose attendance is marked successfully. Attendance is updated automatically in Microsoft excel sheet with his/her ID number, name, date and time.

4. CONCLUSION

Our proposed system will surely prove out to be a boon in the modern era of technology and would be preferred over the superannuated scheme of attendance marking. Many extra resources and time is saved by making use of this system. After successful implementation of this system it is almost impossible to sabotage the system. The system will not only resolve troubles that exists in the traditional model but will also provide better accuracy with rapid results.

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