

Attendance System Using Face Recognition

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Abstract— The traditional attendance system are monotonous and time consuming. In manually recorded attendance, attendance can be easily manipulated. There are many automatic methods such as biometric attendance requires students have to make a queue to touch their thumb on the scanning device. The fingerprint scanner can have problems in capturing an accurate fingerprint image as well. Attendance Management System (AMS) can be made into easier way by using face recognition technique that is the identification of humans by the unique characteristics of their Faces and face recognition has become one of the key aspects of computer vision. Hence, this paper aims at providing a system to record the attendance of the students in classroom environment automatically and provide the facilities to the faculty to access the information of the students easily by maintaining a log.

Key words: Student Enrollment, Open CV, Face detection, Viola Jones, Face Recognition, PCA, Automated Attendance

I. INTRODUCTION

The most common way of tracking student attendance in the classroom is by manually using the traditional pen and paper or file based approach which is normally passed around the classroom while faculty member is conducting the lecture. There are many disadvantages of using such system. The human effort in the existing system is much more than the proposed system. The retrieval of the information is not as easy as the records are maintained in the hand written registers. This application requires correct feed on input into the respective field. Suppose the wrong inputs are entered, the application resist to work. So the user finds it difficult to use.

Our proposed system consists of a camera that captures the images of the classroom and sends it to the image enhancement module. After enhancement the image comes in the Face Detection and Recognition modules and then the attendance is marked on the database server. At the time of enrollment, templates of face images of individual students are stored in the face database. If any face is recognized the attendance is marked on the server from where anyone can access and use it for different purposes. This system uses a protocol for attendance. Camera takes the images to detect and recognize all the students in the classroom. Two databases are displayed in the experimental setup. Face Database is the collection of face images and extracted features at the time of enrollment process and the second attendance database contains the information about the teachers and students and also uses to mark attendance.

II. RELATED WORK

Robust Real-Time Face Detection was proposed by Paul Viola and Michael J. Jones [1]. Systems built on their

proposal were beneficial only when used under various constraints. These constraints included disparate parameters that could not be controlled at times such as variation in the posture of the person, fluctuation in the luminosity of the surrounding, etc. Hence, the systems were termed to be inefficient when not utilized under the required constraints [8].

An Automatic Attendance System Using Image processing was proposed by Aziza Ahmedi , Dr Suvarna Nandyal. In this system, the video is captured from the camera in such a way that it can capture entire students sitting in the classroom and sends it to the administration server using the web service. For the database, first the image of the student is pre-processing and then with the help of Local Binary Pattern (LBP) and Histogram of Oriented Gradients (HOG), the features of face like eyes, nose, and mouth are extracted and then it is subjected to the Support Vector Machine (SVM) classifier. This process the images of the student are stored in the database as input. In the administration server, video is processed. From the video, frame generation is done and the pre-processing of the image/frame is also done. Then image subjected to the Face Detection where faces from the image/frame is detected, the features of the face are to be extracted and then the SVM training is done on the faces. The algorithm compares the detected faces with face database one by one. If the features match then the attendance is marked. The Ada boost technique is also used to avoid false detection. Merit of this system is it uses SVM classifier and a special property of SVM is, it simultaneously minimize the empirical classification error and maximize the geometric margin. So SVM called Maximum Margin Classifiers. But camera takes the video continuously to detect and recognize all the students in the classroom. So system requires more power. [5]

Implementation of Automated Attendance Management System using Face Recognition was proposed by Mrunmayee Shirodkar, Varun Sinha, Urvi Jain, Bhushan Nemade. These system architecture has six basic phases. First phase is Image input of class where Image of class will be taken from camera. Second step is face detection which is done by using Viola Jones algorithm. This algorithm consists of four phase's i.e. integral image, Haarlike Features, AdaBoost and Cascading Classifier. Third step is Face Recognition using Local Binary Pattern. In this algorithm image is divided into several parts and on each part LBP is applied. After this center pixel value is compared with all the neighborhood values if it is greater, then it is 1 else 0. Then all the decimal values are plotted on histogram. Fourth step is Feature Comparison. In this phase, yale database is used for testing and the calculated features are compared with stored features. Fifth step is Attendance Database. If features match in comparison phase, then attendance of student is marked. And Sixth step is Monthly

Report. Report will be generated at the end of month and will be mailed to HOD of department.

This system proposed under various constraints and it is to be inefficient when not utilized under the required constraints. These constraints included disparate parameters that could not be controlled at times such as variation in the posture of the person, fluctuation in the luminosity of the surrounding, etc [7].

III. EXISTING SYSTEM

The Existing system is a manual entry for the students. Here the attendance will be carried out in the hand written registers. It will be a tedious job to maintain the record for the user. The human effort is more here. The retrieval of the information is not as easy as the records are maintained in the hand written registers. This application requires correct feed on input into the respective field. Suppose the wrong inputs are entered, the application resist to work. So the user finds it difficult to use. Existing system requires lot of paper work. Loss of even a single register/record led to difficult situation because all the papers are needed to generate the reports. Every work is done manually so we cannot generate report in the middle of the session or as per the requirement because it is very time consuming.

IV. PROPOSED SYSTEM

The proposed attendance system mainly consists of Four phases; Student enrollment, Face Detection, Feature Extraction, Face Recognition. The working of the system is depicted as follows:

A. Student Enrollment

In this module there will be a student registration form where we are going to maintain student details in the database. We will also capture photo of the student which will be stored in the database. This will help us to give the details of a person when his face is detected and recognized in given group image. The captured images of the student will be sent for image pre-processing. Then that image is sends for face detection. Fig. 1 shows Student Registration Form, All the details of student will be stored in the database which will help us to identify the student when his/her face is detected and recognized in given group image. Image of the face will be taken then facial area will be cropped and stored in the database into binary format. If the face is not propered then we can take image again by clicking the refreshed button provided in the form.

Fig. 1: Student Registration Form

B. Face Detection

In this module, it separates the facial area from the rest of the background image. The separated facial area is transferred on server. Each file transferred is renamed to have a unique ID. And we have used Viola jones Algorithm for face detection. Face detection process will be shown in Fig 2. Rectangular box will separates the facial area and transfers it on server.

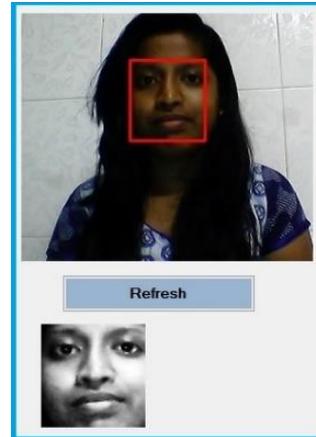


Fig. 2: Face Detection Process

C. Viola Jones Algorithm

- 1) In this system, we utilize Haar cascade classifier which is generally based on feature abstraction, i.e., we use Viola Jones Detector.
- 2) Object Detection utilizing Haar feature-based classifiers is an effective object detection strategy proposed by Paul Viola and Michael Jones in their paper, "Rapid Object Detection uses a Boosted Cascade of Simple Features" in 2001.
 - 1) It is a machine learning based methodology where a cascade function is prepared from a great deal of positive and negative pictures. It is then used to identify objects in different pictures.
 - 2) Steps of Viola-Jones Detector:
 - 3) Calculating the integral image- summed area table necessary for quick calculation.
 - 4) Haar-like Features- simple rectangular features that achieve just above random.
 - 5) AdaBoost learning algorithm- creates a small set of only the best features to create more efficient classifiers.
 - 6) Cascade Filter- discards negative windows early to focus more computational time on possible positive windows.

D. Face Recognition

In this module the face image is then compared with the stored image. If the face image is matched with the stored image then the face is recognized. Then for that particular student the attendance is recorded. It also updates the log table with corresponding image and system time that makes completion of attendance of a student. In face recognition we have used PCA algorithm. Fig 3. Shows recognition of faces, after selecting courses and division, the camera will start by the clicking start device. Recognition of the face is performed with their UserId and attendance will be marked successfully.

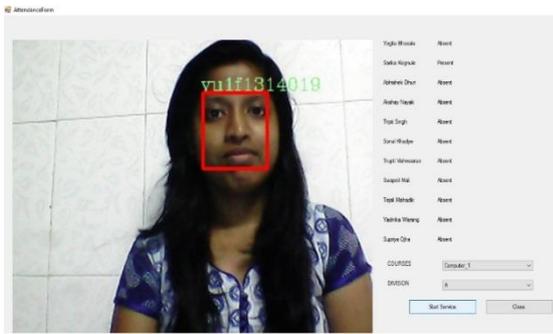


Fig. 3: Recognition of faces

E. PCA Algorithm

PCA method has been widely used in applications such as face recognition and image compression. PCA is a common technique for finding patterns in data, and expressing the data as eigenvector to highlight the similarities and differences between different data. The following steps Summarize the PCA process.

Let $\{D_1, D_2, \dots, D_M\}$ be the training data set. The average Avg is defined by:

$$Avg = \frac{1}{M} \sum_{i=1}^M D_i$$

Each element in the training data set differs from Avg by the vector $Y_i = D_i - Avg$. The covariance matrix Cov is obtained as:

$$Cov = \frac{1}{M} \sum_{i=1}^M Y_i \cdot Y_i^T$$

Choose M' significant eigenvectors of Cov as E_k 's, and compute the weight vectors W_{ik} for each element in the training data set, where k varies from 1 to M' .

$$W_{ik} = E_k^T \cdot (D_i - Avg), \forall i, k$$

F. Attendance Management

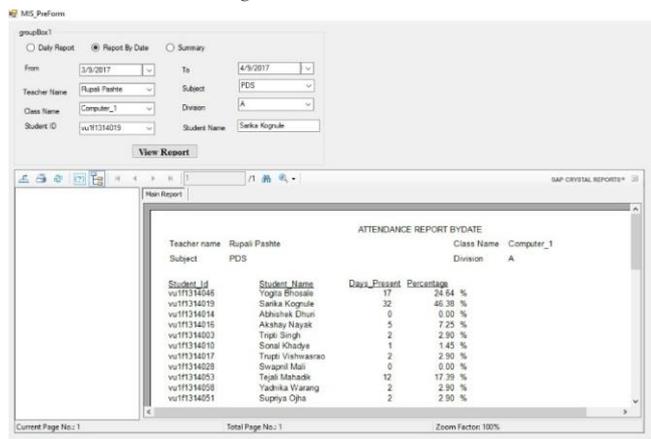


Fig. 5: Monthly Report

This module can be used to view the attendance status of the student. After the face detection and recognition method attendance is marked on the server. This system uses a protocol for attendance. A time table module is also attached with the system which automatically gets the subject, class, date and time. The system automatically gets the attendance without even the interventions of students and teacher. Attendance is maintained on the server so anyone can access it for it purposes like administration, parents and students

themselves. Fig. 4 shows daily attendance report, After choosing the date, attendance for current day will be displayed. Fig. 5 shows monthly attendance report, After choosing the period, attendance for particular days will be displayed.

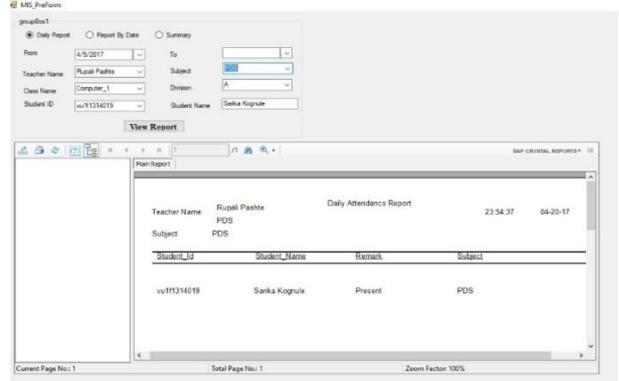


Fig. 4: Daily Report

1) Flowchart

Fig 6. Shows the flowchart of working proposed system.

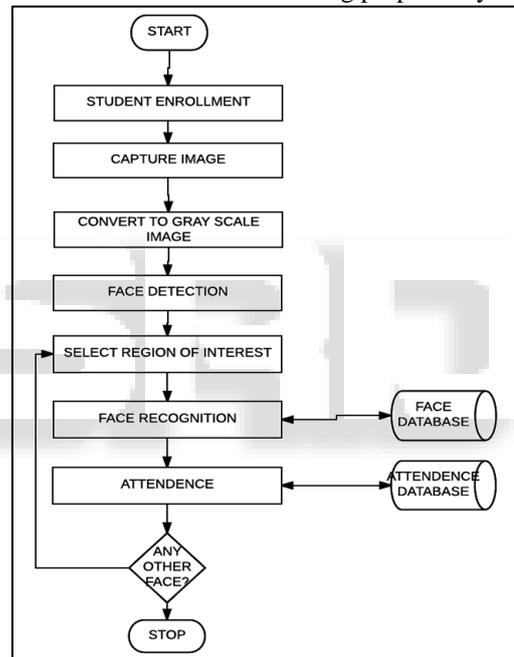


Fig. 6: Flowchart of working proposed system

V. CONCLUSION AND FUTURE SCOPE

Our automated attendance System aims at reducing the errors and solving the issues of traditional attendance system. The purpose of a system is to automate and make a system efficient and accurate to organization such as institute, which can replace the past manual method. This method is secure enough, reliable and available for use. No need for specialized hardware for installing the system in the classroom. The camera plays vital role in the working of the system. Most of the existing systems are time consuming and require for a semi manual work from the teacher or students.

- 1) The future work is to improve the recognition rate of algorithms when there are unintentional changes in a person like tonsuring head, using scarf, and beard.
- 2) Any alternative algorithm can be used in face recognition to identify the variations of face still more clearly.

- 3) 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 most suitable recognition method is selected, Also the current recognition system acquires face images only from face files located on magnetic mediums. Camera and scanner support should be implemented for greater flexibility.

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