

# Attendance Monitoring Using Image Processing

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**Abstract**— Students attendance in the classroom is very important task and if taken manually wastes a lot of time. There are many automatic methods available for this purpose i.e. biometric attendance. All these methods also waste time because students have to make a queue to touch their thumb on the scanning device. This work describes the efficient algorithm that automatically marks the attendance without human intervention. This system consists of four phases-face database, face detection, face recognition and marking attendance. This attendance is recorded by using a camera attached in the classroom that is continuously capturing images of students. The system first stores the faces in the database, then the faces are detected in the images. The detected faces are compared with the faces stored in the database during face recognition. If the system recognizes faces, the attendance gets marked immediately of recognized faces.

**Index Terms**— Attendance, detection, feature extraction, image conversion, recognition.

## I. INTRODUCTION

Maintaining the attendance is very important in all the institutes for checking the performance of students. Every institute has its own method in this regard. Some are taking attendance manually using the old paper or file based approach and some have adopted methods of automatic attendance using some biometric techniques. There are many automatic methods available for this purpose i.e. biometric attendance. All these methods also waste time because students have to make a queue to touch their thumb on the scanning device. This system uses the face recognition approach for the automatic attendance of students in the classroom environment without student's intervention. This attendance is recorded by using a camera attached in the classroom that is continuously capturing images of students, detect the faces in images and compare the detected faces with the database and mark the attendance.

## II. Literature Review

The old method for taking attendance is manual work. But this method takes a lot of time and there are chances that the attendance is not marked properly. The second method is finger print recognition. But for some people it is intrusive, because it is still related to criminal identification. Another

disadvantage of finger print recognition is that it can make mistakes with the dryness or dirt of the finger's skin. The another method for taking attendance is iris recognition. The disadvantage of this method is that it is also intrusive and a lot of memory is required for data storage.

There are various methods for facial recognition like eigenface method. Various extensions have been made to the eigenface method such eigenfeatures. This method combines facial metrics (measuring distance between facial features) with the eigenface representation. Another method similar to the eigenface technique is 'fisherfaces' which uses Linear discriminant analysis[1]. This method for facial recognition is less sensitive to variation in lighting and pose of the face than using eigenfaces. Fisherface[2] utilizes labelled data to retain more of the class specific information during the dimension reduction stage. A further alternative to eigenfaces and fisherfaces is the active appearance model[3]. This approach use an Active Shape Model to describe the outline of a face. By collecting many face outlines, Principal Component Analysis[4] can be used to form a basis set of models which, encapsulate the variation of different faces. Many modern approaches still use Principal Component Analysis as a means of dimension reduction or to form basis images for different modes of variation.

## III. Proposed Plan of Work

The system consists of a camera that captures the images of the students sitting in the classroom and sends it to the image enhancement module. In the image enhancement module, images are enhanced so that matching can be performed easily. After enhancement, the image comes in the Face Detection and Recognition modules and then the attendance is marked in the database. At the time of enrolment, templates of face images of individual students are stored in the Face database. Here all the faces are detected from the input image and the algorithm compares them one by one with the face database. If any face is recognized the attendance is marked in the database from where anyone can access and use it for different purposes. Teachers come in the class and just press a button to start the attendance process and the system automatically gets the attendance without even the intensions of students and teacher. In this way a lot of time is saved and this is highly securing process no one can mark the attendance of other. Camera takes the images continuously to detect and recognize all the students in the classroom. In order to avoid the false detection we are using the skin classification technique [5]. Using this technique enhance the efficiency and accuracy of the detection process.

In this process first the skin is classified and then only skin pixels remains and all other pixels in the image are set to black, this greatly enhance the accuracy of face detection process. For face recognition we have used PCA. Principle component analysis is an efficient method for face recognition. It not only retains some of the variations in the image data. The system functions by projecting face image onto a feature space that spans the significant variations among known face images. The significant features are known as "Eigen faces", because they are the eigenvectors (Principal Component) of the set of faces they do not necessarily correspond to the features such as eyes, ears, and noses. The projection operation characterize an individual face by a weighted sum of the Eigen faces features and so to recognize a particular face it is necessary only to compare these weights to those individuals.

### 3.1. Enrolment of Student Faces

First step in every biometric system is the enrolment of a person using general data like their name and their unique biometric features as templates.

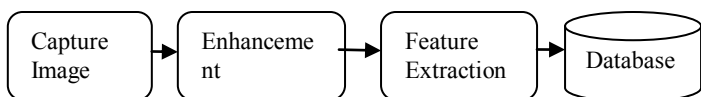


Fig.1. Enrollment Process

Image is captured from the camera and then student face is detected. After the face is detected, that face is cropped and then it is enhanced using histogram equalization and noise filtering so that exact features can be extracted. These unique features are then stored in the face database with certain id of that person.

### 3.2 Capturing the Images of Student

Camera attached in front of classroom that is continuously capturing parts. images of students, detect the faces in images and compare the detected faces with the database and mark the attendance. In order to avoid the false detection we are using the skin classification technique. Using this technique enhance the efficiency and accuracy of the detection process. In this process first the skin is classified and then only skin pixels remains and all other pixels in the image are set to black, this greatly enhance the accuracy of face detection process. How capture works

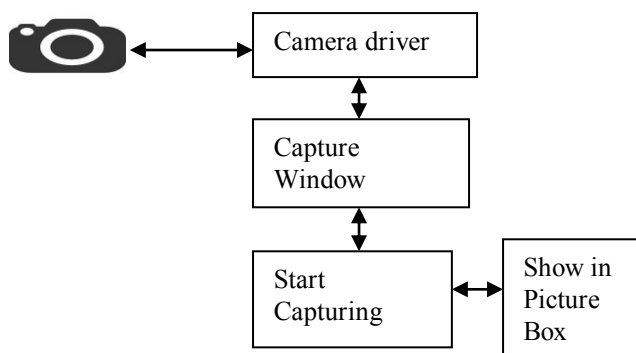


Fig2. Capturing Process

In the first step image is captured from the camera. There are illumination effects in the captured image because of

different lighting conditions and some noise which is to be removed before going to the next steps. Histogram Normalization is used for contrast enhancement in the spatial domain. Median filter is used for removal of noise in the image. There are other techniques like FFT and low pass filter for noise removal and smoothing of the images but Median filter gives good results.

### 3.3 Face Localization and Face Detection

Face localization aims to determine the image position of a single face. This is a simplified detection problem with the assumption than an input image consists only one face [6] . The procedure below explains the proposed face localization technique.

#### 3.3.1) Image Conversion

The input image is first converted into the gray-scale image. The gray-scale image is then converted into its binary form.

#### 3.3.2) Dilation

The dilation process removes the noise encountered in the binary image. Hence, the dilation operation is performed on the binary image obtained. The gray-scale image is then converted into its binary form. Then, the dilated image is mapped on to the gray scale image.

#### 3.3.3) Image Cropping

The mapped image is converted into binary image and the required face region is cropped from the binary image and is saved to the database. The execution sequence of image cropping is as follows:-

The Feature Extraction is carried out by taking the features such as eyes, mouth, nose, ears etc. In this paper, the two features, eyes and mouth are taken into consideration. The proposed feature extraction algorithm is explained below.

1. Divide the localized face column wise into two equal

parts.

2. For each row 'r' do steps 3 and 4.

3. The first black pixels encountered on either side are taken as (x1, y1) and (x2, y2) respectively.

4. Calculate the distance between those points using the formula:

$$Distance = (\sqrt{(x2 - x1)^2 + (y2 - y1)^2}) \quad (1)$$

5. From step 4, two sets of non-zero distance values corresponding to eyes and mouth are obtained.

6. Find the maximum of the distances for each non-zero set. They represent the distance between the eyeballs and the distance between the mouth end points.

7. using the pixels corresponding to that maximum distance, calculate the following:

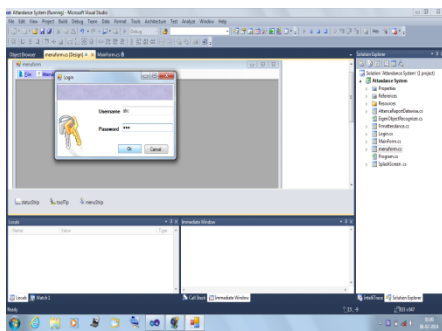
- i. Distance from the left eyeball to the right eyeball.
- ii. Distance from the left mouth end point to the right mouth end point.
- iii. Distance from the left eyeball to the left mouth end point.
- iv. Distance from the right eyeball to the right mouth end point.
- v. Distance from the left eyeball to the right mouth end point.

- vi. Distance from the right eyeball to the left mouth end point.
- 8. The six values calculated above are given as the inputs to the neural network recognizer.

### 3.3.4) Face Recognition & Marking Attendance

After extracting the features from the given face image, a recognizer is needed to recognize the face image from the stored database. 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 in the database.

## IV. IMPLEMENTATION



- Enrolment of student faces.
- Capturing the images of students.
- Face localisation and face detection.
- Face recognition and marking attendance.

Following are the screenshots of the implementation of this project-

#### Login form:

The Login Form is a gateway for using and configuring the Word Press publishing platform. It controls access to the Administration screen allowing only registered users to login. Simply by entering user id and password, the user can login into the system.

Fig3.Login Form

#### Menu form:

This window contains the list of menu items. The menus are file, attendance and report. In file menu there is an option

for exiting the system. Through attendance menu, we can go to the attendance system where the faces are recognised and attendance is marked.

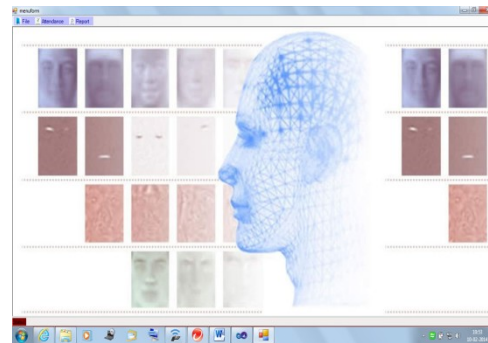


Fig4.Menu Form

#### Attendance system:

This window consists of the main screen. First the camera gets on by clicking on the detect and recognise button. Here by clicking on the add face option, we can create our database consisting of faces.

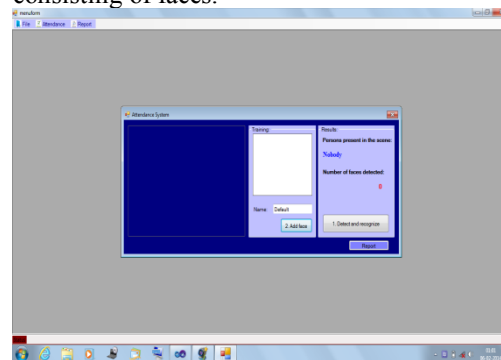


Fig5.Attendance System

#### Face detection:

This window consists of the detecting faces. Whenever a new face is detected, it can be saved into the database with the corresponding new name.

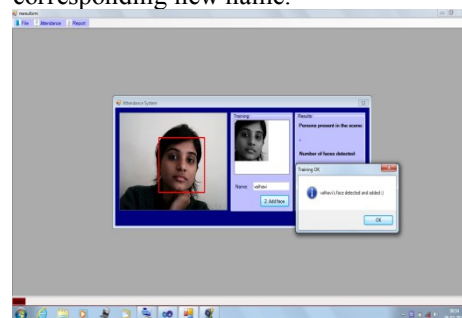


Fig6.Face Detection

#### Face Recognition:

First the faces on the screen are traced out and the recognition process starts. During the recognition phase, the detected facial features are compared to the features stored in our database. If the system recognises the features, the corresponding face is recognised and the name of the recognised person is displayed on the screen.

V. Conclusion

This paper introduces a system that helps in taking attendance using face recognition. Another application of this system is that it is capable of marking the presence of employees at any workplace and this attendance will be useful for calculating their monthly payment.

References

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- [6]" Anil K. Jain, Arun Ross and Salil Prabhakar," An introduction to biometric recognition", Circuits and Systems for VideoTechnology, IEEE Transactions on Volume 14, Issue 1, Jan. 2004 Page(s):4 – 20"

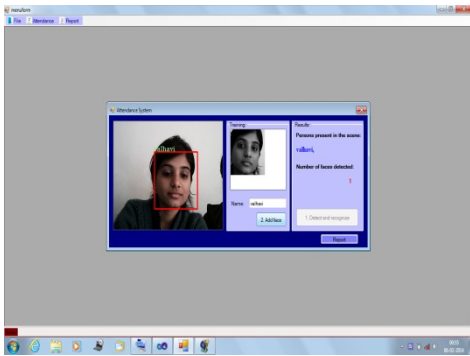


Fig7.Face Recognition

Multiple Face Recognition:

This scheme also works for multiple faces. Multiple faces are also recognised in this system.

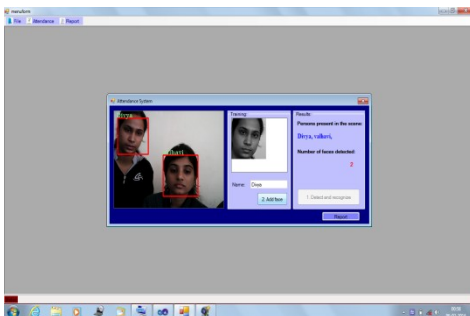


Fig8.Multiple Face Recognition

Report:

This window shows the report of the marked attendance. Attendance is marked along with the date and the time for each student for that particular lecture.

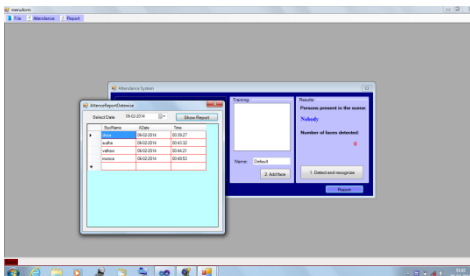


Fig9.Report

Detailed Report:

The detailed report can be seen for any date and time. The attendance is stored into the database.

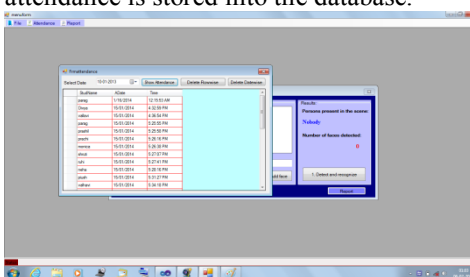


Fig10.Detailed Report