

# Smart Attendance System using Face Recognition

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**Abstract:-** The automated attendance system described in this article was created using the MATLAB programming language. We want to build a "Automated Attendance System Based on Facial Recognition," which will be useful for a variety of purposes in a variety of settings. In order to accommodate the face authorization, the application includes face identification, which saves time while also eliminating the potential of proxy attendance. Therefore, this technology may be employed in a situation when attendance is crucial. Built on the MATLAB platform, the system is easy to use. The Principal Component Analysis (PCA) approach, which is based on eigen faces, is used in the proposed system. This approach evaluates the test and training photos in order to identify which students are present and which students are not present on the test and training images. A record of attendance is maintained in an excel sheet that is automatically updated by the system. Because it is time-consuming and has a high risk of error throughout the data-input process, the conventional system fails to manage student attendance in a large classroom. In this study, an automated attendance marking system based on face recognition was developed and shown.

**Keywords:-** smart attendance; MATLAB; face recognition; image processing.

## I. INTRODUCTION

Educational institutions are becoming more concerned with the constancy of student attendance. This is mostly due to the fact that students' overall academic performance is impacted by their attendance at the institution. When it comes to documenting attendance, the two most frequent methods are calling out the roll call and having pupils sign a piece of paper. They were both more time-consuming and more difficult [1] to complete. It is thus necessary to implement a computer-based student attendance management system to assist teachers in maintaining attendance records on a consistent basis. Over the last several years, video-based face recognition has received a great deal of attention, and it has emerged as one of the most important research questions in the area of image processing for people's identification [2]. Despite the fact that there are many more accurate methods of identification than face recognition, it is making gradual but steady progress in biometrics owing to its noninvasive nature and the fact that it is the most used method of identifying individuals. When employed in the educational business, it may be used to regulate student attendance. Various organisations, such as schools and businesses, require that students and employees report to work. There is an ancient technique of documenting attendance in a register that is both time-consuming and exhausting, as well as easily manipulated, destroyed, or lost. We are all acquainted with this system. Many biometric solutions, including as fingerprints, iris recognition, smart

cards, and others, have been developed to address this problem, and are currently being used successfully in businesses of all sizes to prevent it from occurring. Due to the fact that it may be used for a range of applications like video surveillance, attendance monitoring in different firms, and other security objectives [5,] face recognition is the primary focus of researchers in this field. It is shown in this article how face recognition technology may be used in the field of education to construct a reliable attendance system that automatically records an enrolled individual's presence inside a particular place without the need for human intervention. While the technique for using a face recognition system is divided into multiple steps, the most important of these are the face detection and recognition steps. To begin, it will be required to take a photo of each student's face in order to record their attendance. Obtaining this image may be accomplished by either recording a video or collecting an image from a camera device that will be placed within the classroom at a convenient position from which the whole classroom can be seen is possible.

During the lesson, the camera will take video for a few seconds, following which the system will scan through the video frames and identify the students' faces [7].

Following the capture of the frames, the system conducts face recognition, which distinguishes between facial objects and non-facial things in the images. Face recognition is accomplished by the use of the Viola Jones approach, which combines an Adaboost algorithm with Haar feature classifiers. Face detection using Viola Jones is the most successful and often used way of identifying people.

Following that, the clipped faces are subjected to facial recognition processing using the suitable method. The methods of Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA) are used in this work, and the recognition accuracy of both approaches is assessed. PCA is used in combination with Eigenfaces to provide the best results. A photograph's Eigenfaces are the visual qualities of the picture that have been extracted and include relevant information about the picture. The face database, which serves as our training set, is utilised to identify the picture in the input. Attendance is documented in an excel spreadsheet when a legitimate match is discovered.

During this investigation, the training set comprised of 5 images per subject, each of which was taken from a different location. We may produce a wide range of experimental results by varying the size of the training set used.

**II. PREVIOUS WORK**

Using a survey of the literature on video and image-based face recognition, we learn about the many face recognition algorithms available, and we also recognise that face recognition is generally a two-step process that involves both face detection and face recognition. It is impossible to overestimate the significance of detection in getting a high recognition rate for a given set of data. Face detection and identification algorithms have been developed in recent years by academics.

Implementing a classroom attendance system [1] [6] is a major undertaking that requires a considerable lot of work. Previously, in [1,] we learnt about the two-stage automated attendance system technique. [4] Improves the picture quality, which suggests that the recognition rate has increased. [7] investigates Neural Network Based Face Detection as well as Local Binary Pattern Recognition (Adaboost algorithm, SMQT Features, and SNOW Classifier Method).

Researchers presented a variety of methods for image/video-based face recognition, including [9 10 11 12 13 14] using Eigenfaces in Principle Component Analysis (Linear Discriminant Analysis (15 16) and comparing LDA to other face recognition approaches [17 18 19]. Researchers also presented a variety of methods for image/video-based face recognition, including [9 10 11 12 13 14] using Eigenfaces in Principle Component Analysis (Linear Discriminant Analysis (15 16) and comparing LDA to other face recognition They all employed the ARMA model, which is also known as the probabilistic appearance manifold, and the hidden Markov model. [20] conducted an in-depth examination of a broad variety of possible solutions to the difficulties. The usual face detection model is shown in Figure 1.

The face detection model shown in Figure 1.

Every organisation makes use of a basic attendance monitoring system to keep track of how many students and personnel are present at each event. Participation in every organisation is tracked physically, with representatives addressing members by their registration numbers or names and documenting it in attendance registers given by the group's leaders, which requires additional time and effort. Face recognition is an example of a recognition method, as well as one of the most significant biometrics; it is utilised in a broad range of applications and is becoming more popular. Every institution has its own system for keeping track of attendance. Some individuals continue to utilise the conventional manual technique of recording attendance, while others use radio frequency identification (RF Id) [1]. The iris, retina, thumb imprint, palm identification and ear recognition are some of the other biometric technologies that have been implemented [2]. All of these systems, however, waste students' time since lengthy queues develop for the purpose of documenting attendance. While face recognition is not as invasive as the systems previously mentioned, it does have certain advantages over them, including the fact that it is noncontact and has a natural acquisition process. Universality, permanence, uniqueness, performance, and measurability are all requirements for biometric identification [3, which is also known as biometric authentication]. Numerous biometric attendance system techniques have been developed by academics and industry professionals. [19] developed a student management system based on OpenCV and a Raspberry Pi module that communicates with a fingerprint device [1]. [20] proposed an automatic attendance structure based on face detection techniques such as Adaboost and feature extraction approaches such as local binary and histogram of orientation. Figure 2 is an illustration of a face-based attendance marking system.

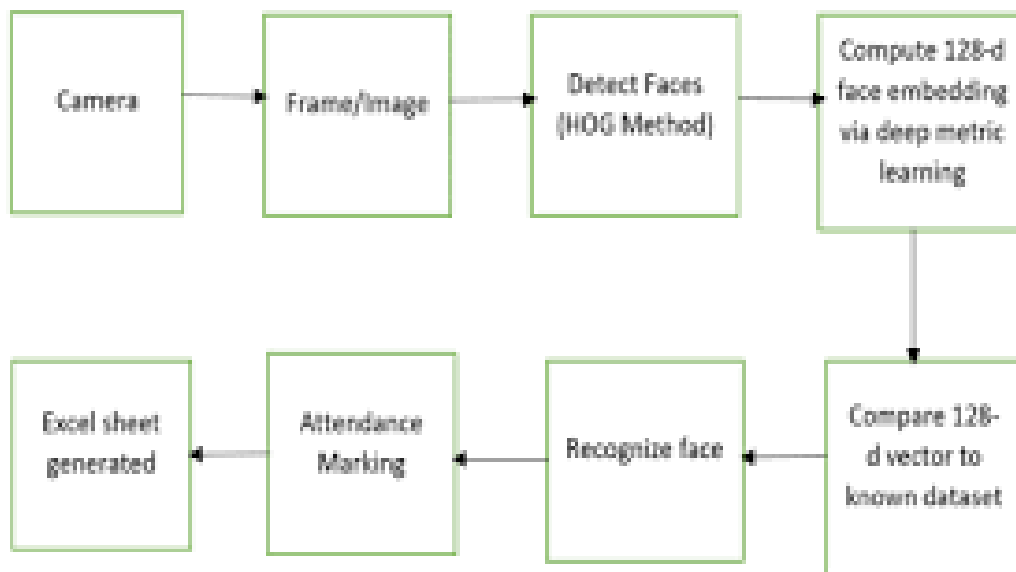


Fig. 2: Attendance marking system

An embedded attendance management system for Linux is presented in the paper [5], which makes use of skin classification and histogram normalisation methods to control attendance. [9] used image enhancement techniques as well as skin classification algorithms in his research. [10, 11] The functioning of an automatic attendance system, which utilises numerous color-based techniques for face recognition and Principal Component Analysis (PCA) for face identification, is described in detail by [7], who also provides his research.

**III. PROPOSED WORK**

Essentially, a face recognition system is a computer vision software that can accomplish two core tasks: the identification of a person and the verification of that identification. With the advent of image processing technologies, automatic face recognition has risen to the top of the research priority list. Professors have long taken attendance at schools, institutes, and universities, and the results are recorded in attendance registers, which are stored on site. A camera, as well as a computer with the very helpful and multi-functional machine language "MATLAB" and Microsoft Excel installed, will be required due to the interdependence of hardware and software.

Before trying to capture an image or video, connect the camera to the PC and ensure that the camera driver has been appropriately installed and is compatible with MATLAB, as described in the previous section.

Our Smart Attendance System is very user-friendly and basic to use.

It is provided in the MATLAB portion of the package to do face recognition. Module for facial recognition- As a result, we create a feature set for each of the images in the database by submitting photographs taken by each user to MATLAB and using one of the feature extraction methods, such as PCA (Principal Component Analysis), we construct a collection of face features for each of the images in the database. Images of human faces may be obtained in real time from a USB camera over a USB interface.

For this, you'll need to make use of the Image Acquisition Toolbox in MATLAB to setup, access, and transport a single camera frame at a time into MATLAB's workspace, where it may be further processed using the Image Processing Toolbox. Figure 3 depicts a comprehensive block schematic of the system.

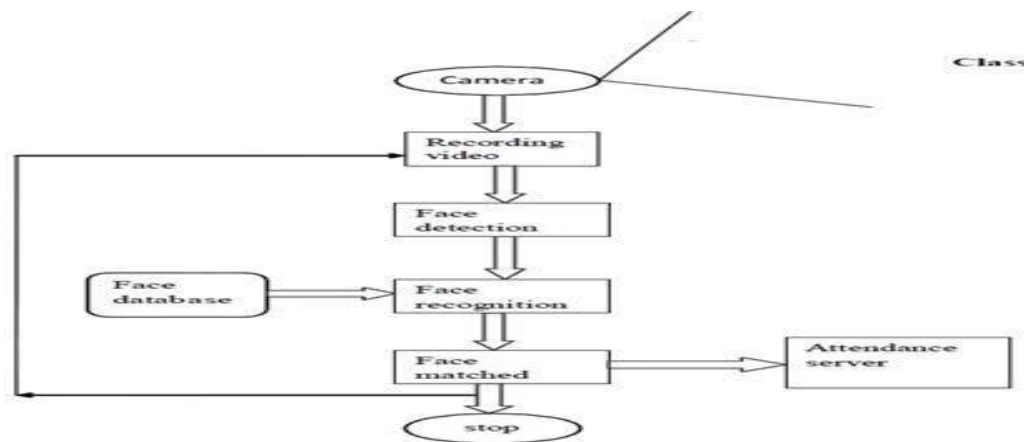


Fig. 3: block diagram

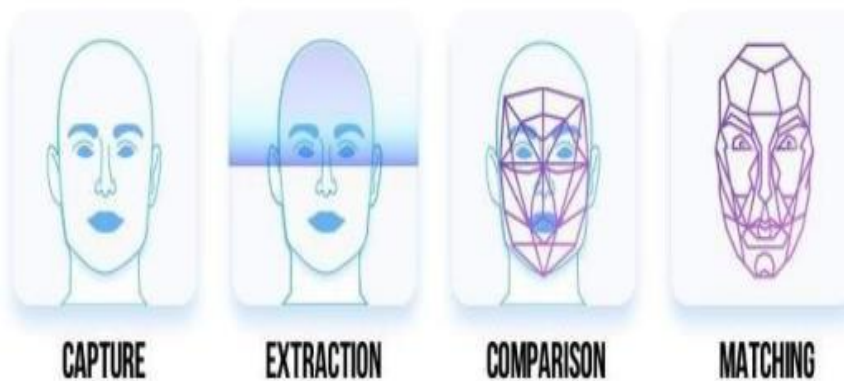


Fig. 4: Process in Matlab

It is demonstrated in figure 4 how the picture extraction procedure is carried out.

While the technique for using a facial recognition system is broken down into multiple components, the following are the most significant of them:

A. *Recognition of a person's appearance*

Face recognition is the second most popular method.

To begin, a photograph of each student's face will be required in order to keep track of their participation. It is possible to acquire this image by either recording a video or taking a photograph using a camera equipment.

A short video of the student will be recorded by the camera for a few seconds, following which the system will

scan the video and identify the students based on their facial features.

Following the capture of the frames, the system conducts face recognition, which distinguishes between facial objects and non-facial things in the images.

Afterwards, the clipped face is analysed using a facial recognition algorithm that is suited for the situation.

The picture is recognised by comparing the input image to a face database that has been created. Attendance is documented in an excel spreadsheet when a legitimate match is discovered. Figures 4 and 5 show the output pictures for the project and MATLAB, respectively.

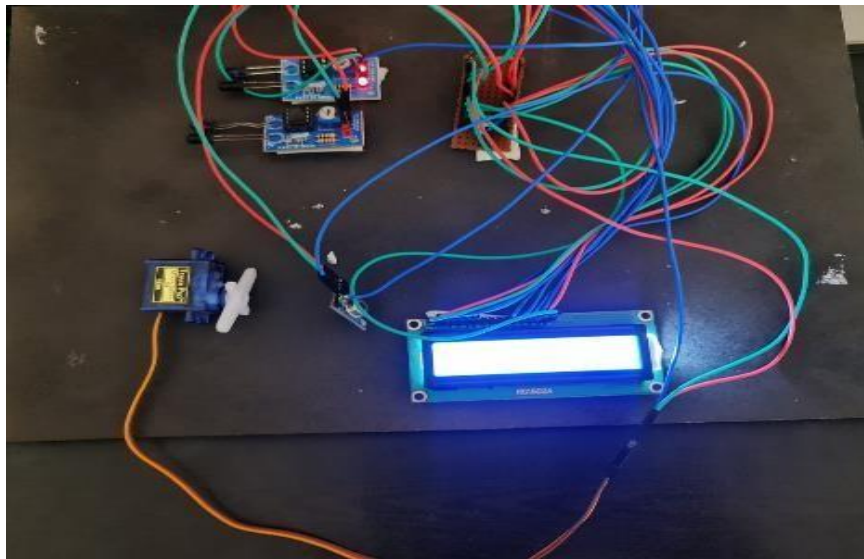


Fig. 5: Hardware connected with Matlab

In Figure 5, we have utilised an Arduino microcontroller to drive a servo motor and an IR sensor to count visitors to a display. In this case, a contactless temperature sensor is also employed for the identification of covid symptoms. We are receiving serial output input from the Arduino microcontroller using the Matlab

programme. After computing the person's attendance and body temperature, the result is shown as "OK," which signifies that the person's condition is met. If this is true, the servo motor will activate. And then the door will open. If this is not the case, access is refused.

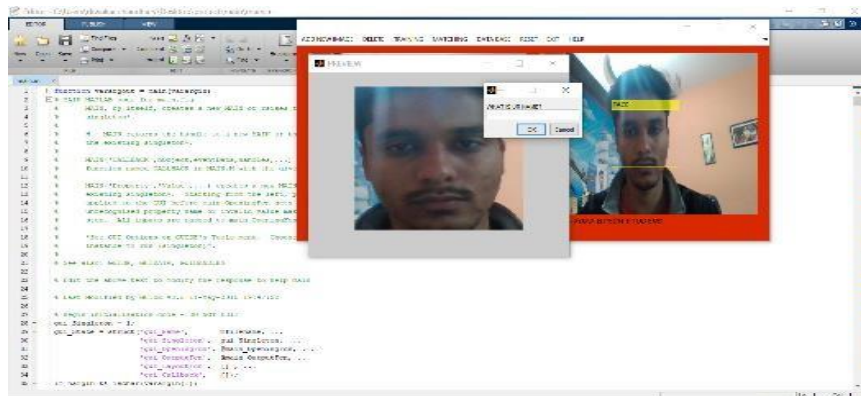


Fig. 6: MATLAB Output 1



attendance\_sheet - Notepad

File Edit Format View Help

Name	Date	Time	Attendance
Diwakar	29-Jan-2022	11:8:53	Present
Name	Date	Time	Attendance
Diwakar Dhillon	16-Feb-2022	9:30:15	Present

Fig. 7: MATLAB Output 2



Fig. 8: Final output

In figure 8, it shows how attendance is marked in text form.

**IV. CONCLUSION**

Facial recognition, often known as face recognition, is a technology that analyses the characteristics of a person's facial image taken by a camera. Overall facial structure as well as distances between the eyes, nose, mouth, and jaw boundary lines are measured using this method. These measures are taken when a person stands in front of a camera and are kept in a database, which may then be used as a comparison. The fact that facial recognition is non-intrusive is one of the most major benefits of using it. Users may do verification or identification from a distance of two feet or more without the need to wait long periods of time or do anything other than look at the camera for the process to be completed successfully. The confirmed attendance was successfully entered into an excel spreadsheet. The prototype was up and running, and it was devoid of bugs.

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