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A Review Paper on Face Recognition Based Attendance Management System

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Abstract: Face recognition systems are essential inpractically every industry in our digital age. One biometric that is frequently utilized is face recognition. It has numerous more benefits in addition to being useful for security, identity, and authentication. Due to its non- invasive and contactless nature, fingerprint and iris recognition systems are still commonly employed despite their lower accuracy. Additionally, facial recognition systems can be utilized in companies, institutions, and schools to indicate attendance. With the help of this system,a class attendance system that makes use of the idea of facial recognition in place of the labor-intensive and time- consuming manual attendance system currently in use. Also, there might be opportunities for proxy attendance. As a result, this mechanism becomes more necessary. The development of the database, face detection, face recognition, and attendance updating are the four stages of this system. Images of students in class are used to develop databases. The Haar-Cascade classifier and the Local Binary Pattern Histogram technique are used, respectively, for face detection and recognition. Faces are identified and detected from the classroom's live streaming footage. At theconclusion of the session, attendance will be mailed to the appropriate faculty member.

This abstract introduces a Face Recognition-based Attendance Management System tailored for educational institutions. The system employs facial recognition technology to automate attendance tracking in schools or colleges. By analyzing facial features, it accurately identifies students, reducing the need for manual attendance marking. This technology adapts to various environmental conditions, ensuring reliable performance. The system enhances overall efficiency, minimizes errors, and provides a secure and convenient solution for managing attendance in educational settings. Its user-friendly interface facilitates easy integration into the existing educational infrastructure, offering a modern and reliable alternative to traditional attendance methods.

I. INTRODUCTION

In many schools and universities, recording attendance using the traditional technique is a laborious effort. Additionally, it adds to the workload for faculty members who must manually call students' names to record attendance—a process that could take up to five minutes during a full class. It takes a lot of time to do this. Proxy attendance is possible in some circumstances. As a result, a lot of institutions began using additional methods for tracking attendance, such as fingerprint, Radio Frequency Identification (RFID) [4], iris recognition [5], These methods, however, are obtrusive and queue-based, which could take additional time.

Face recognition has established a crucial biometric characteristic that is non-intrusive and simple to learn. Systems that rely on facial recognition are not very sensitive to different expressions on the face. Face identification and verification are the two categories that make up a face recognition system. In contrast to 1:N problems, which compare a query's face images with the template face images, face verification uses a 1:1 matching technique.[3] This system's goal is to develop an attendance system thatuses facial recognition technology. Here, a person's face will be taken into account while recording attendance. These days, facial recognition is becoming more and more commonplace. In this research, we proposed a system that recognizes students' faces in real-time streaming videos. if the identified face is located in the database, the attendance record of the classroom will be marked. It will take less time with this new system than with the old ones. the launch of an attendance system based on facial recognition

Management System in schools or colleges signifies a transformative approach to traditional attendance tracking. This innovative system harnesses the power of facial recognition technology to streamline and modernize the attendance process. By capturing and analyzing facial features, the system offers a reliable and efficient method for automatically recording student attendance. In educational settings, where time is precious, this technology eliminatesthe need for manual attendance taking, reducing administrative burdens. Moreover, the adaptability of facial recognition to different lighting conditions and facial expressions ensures accuracy in diverse scenarios. Students simply need to be present for theirfaces to be recognized, making the process seamless and non- intrusive.

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This introduction of technology not only enhances accuracy but also contributes to a more secure and organized educational environment. The user-friendly interface allows educational institutions to seamlessly integrate the system into their existing infrastructure. It provides administrators with a comprehensive tool to monitor attendance, generate reports, and analyze attendance patterns over time. As schools and colleges embrace this cutting-edge solution, they embark on a journey towards increased efficiency, reduced errors, and a more technologically advanced approach to attendance management.

II. LITERATURE SURVEY

A model of an automatic attendance system was presented by the authors in [4]. The model focuses on how approved pupils are identified and counted as they enter and exit the classroom using face recognition and Radio Frequency Identification (RFID). Every enrolled student's real recordis maintained by the system. Additionally, the system stores information about each student enrolled in a specific course in the attendance log and makes available the information that is required.

The authors of this study [5] have created and put into practice an attendance system that makes use of iris biometrics. The first thing that the visitors were required to do was register their information and iris template. The technology automatically recorded attendance in class by taking a picture of each student's eye, identifying their iris, and checking for a match in the database that was produced. The web served as the prototype. The authors of [6] suggested a facial recognition-based attendance system. The system was implemented using algorithms such as Viola-Jones and Histogram of Oriented Gradients (HOG) features in conjunction with a Support Vector Machine (SVM) classifier. The authors took into account a number of real-time circumstances, including scaling, illumination, occlusions, and position. Using the MATLAB GUI, quantitative analysis based on Peak Signal to Noise Ratio (PSNR) values was carried out.

By analyzing the Receiver Operating Characteristics (ROC) curve, the authors of [7] conducted research to determine which facial recognition algorithm—Eigenface and Fisherface—was superior. The results were subsequently included into the attendance system. The ROC curve demonstrated that Eigenface outperforms Fisherface in the studies conducted for this paper. The accuracy rate of the system that used the Eigenface algorithm was between 70%and 90%. In [8], authors used Discrete Wavelet Transforms (DWT) and Discrete Cosine Transform (DCT) to propose a face recognition approach for a student attendance system in the classroom. These techniques were utilized to extract the characteristics from the student's face, and then the Radial Basis Function (RBF) was applied to classify the things on the face. The accuracy rate attained by this technique was 82%.

III. IMPLEMENTATION OF SYSTEM

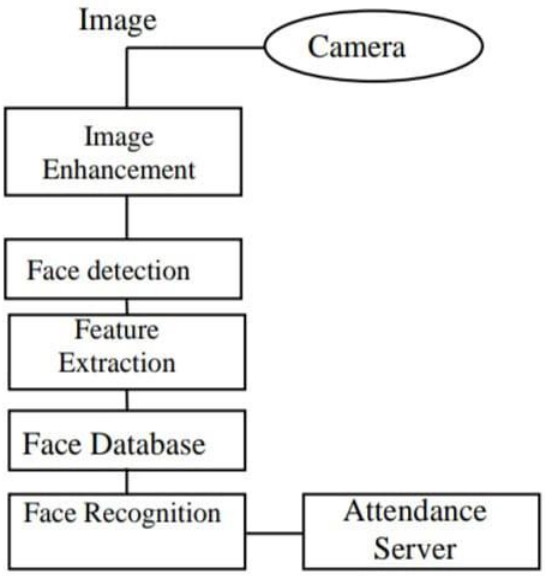

Fig. a. Block Diagram

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Image Enhancement: The process of image enhancement uses user-provided photos to assess each image's quality and then applies machine learning techniques to improve the image's quality. The most important consideration for identifying a certain individual is image quality, which is why the Haar Cascade method works well for image augmentation and optimization.

Face Detection: The student enrolls detention photographs in the attendance management system initially, and the management side creates the image pattern in our database. The registered picture corresponded to every database image; if that image was present in the system database, the student patent was either marked as present or absent.

Feature Extraction: This stage involves extracting all the data from the sample that was made in order to generate a template using facial recognition.

Face Database : In this step, the system can parallelly enter a carbon copy with database photos using the dataset that was previously current in the system's database. Store all student information in a database to aid the system in quickly obtaining a comprehensive picture of each student's presence.

Face Recognition: The facial structures of the gathered samples are compared to those from a facial database in this final stage of face recognition. It won't take long at all. We can use the Haar Cascade approach to this system. An artificial neural network that is specifically made for pixel data and is utilized in image processing and recognition is called a Haar Cascade.

Attendance Marking: In this last step of face recognition, the collected samples' facial structures are compared to those from a facial database. It won't take too long. The Haar Cascade method can be applied to this system. A Haar Cascade is a type of artificial neural network used in image processing and recognition that is designed exclusively for pixel data.

Typically this process can be divided into four stages,

1. Dataset Creation:

A web camera is used to take pictures of the kids. A single pupil will be captured in multiple photos from different viewpoints and motions. These photos are pre-processed. To create the Region of Interest (ROI), which will be subsequently utilized in the recognition process, the photos are cropped. The clipped photos must then be resized to a specific pixel position. After that, these RGB photos will be transformed to grayscale images. After that, a folder containing the names of each student will have these pictures saved in it.

2. Face Detection

Here, the Haar-Cascade Classifier with OpenCV is used to detect faces. Before the Haar Cascade method can be utilized for face identification, it must be trained to recognize human faces. We refer to this as feature extraction. A file named Haar-Cascade frontal face_default.xml contains the training data for the Haar-Cascade model. The feature extraction process will make use of the Haar features displayed in Fig.b.

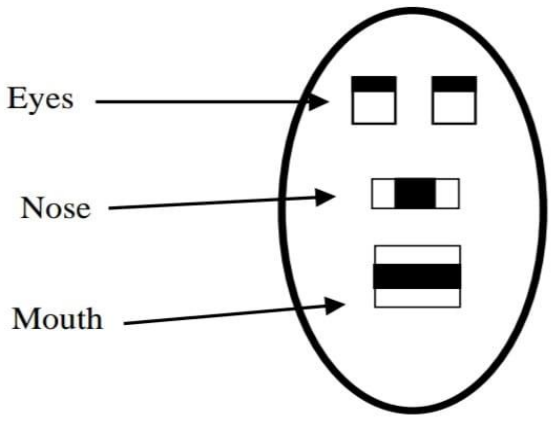

Fig b. Haar Features

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Here, we're utilizing OpenCV's detect Multiscale module.To draw a rectangle around the faces in an image, this is necessary. Three criteria are taken into account: minNeighbors, minSize, and scaling factor. To specify how much a picture has to be shrunk in each image scale, use the scaleFactor.

The number of neighbors that each candidate rectangle must have is specified by minNeighbors. Higher values typically identify fewer faces but higher image quality. The minimal object size is specified by minSize. Itis (30,30) by default [8]. The scaleFactor and minNeighbors parameters, with respective values of 1.3 and 5, are utilized in this system.

3. Face Recognition:

The three processes of face recognition include preparation of training data, training of the face recognizer, and prediction. The photographs in the dataset will serve as the training data in this case. An integer label designating which student it belongs to will be assigned to them. Then, face recognition is applied to these pictures.

This system uses a Local Binary Pattern Histogram as a face recognizer. First, the complete face's list of local binary patterns (LBP) is acquired. Following the conversion of these LBPs into decimal numbers, histograms of each decimal value arecreated.

Every image in the training set will ultimately have a single histogram created for it. The best matching label for the student to whom the face belongs is subsequently returned when the histogram of the face to be identified is later generated and compared with the previously computed histograms [9]..

4. Attendance Updation

Following the face recognition procedure, the faces that were identified will be noted as present in the excel sheet, while the remaining faces will be noted as absent. A list of the absentees will then be mailed to the relevant faculties. Monthly attendance sheets will be updated for faculties atthe conclusion of each month. Outcome

Facial recognition is used in the attendance managementsystem, which is incredibly easy to use and efficient in short amounts of time. Because this is an automated system, the number of times the administrator creates a student's profile in the database will determine how often the system uses it for face detection and recognition. Haar Cascade techniques form the foundation of this system. The administrator must first build a profile for each student in the system, including their name, department, roll number, and other educational information.

Through a GUI, users can communicate with the system. Here, users will primarily have access to three options: mark attendance, faculty registration, and student registration. It is expected of the students to fill out the student registration form with all necessary information. Following the registration button click, the webcam launches automatically, displaying the window depicted in Figure c. The window then begins to recognize faces inside the frame.

Faculty members are required to register using the given faculty registration form, providing their email address and the appropriate course codes. This is significant since the corresponding faculties will eventually receive a list of thosewho did not show up. Each session, the appropriate faculty member needs to input their course code. The camera will then turn on automatically after the course code has been submitted.

Students who are enrolled are recognized, and if they weren't, it would have said "unknown." Should a registered student be identified, the Excel sheet will be updated with their attendance, and the names of those who are absent will be communicated to the relevant faculty members. The marking system assigns a value of '1' to recognized students and '0' to absentee students.

IV. CONCLUSION

This system uses facial recognition algorithms to create an efficient way to track students' attendance in class. Face ID will be able to be used by the proposed system to track attendance.

Through the use of a webcam, it will first identify faces. Following acknowledgment, the attendance record will be updated and the recognized student's attendance will be noted.

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