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Face Recognition Based Attendance Management System

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Abstract-
The goal of the "Face Recognition Based Attendance Management System" project is to create an automated attendance system that efficiently and reliably marks attendance using facial recognition technology. As people enter a specified region, the technology would take pictures of them and compare them to a database of people who have already registered. The system would record the person's attendance and save the data for further use after a successful identification.

By completing this project, manual attendance takingâ€"which may be laborious and error-proneâ€"would no longer be necessary. Additionally, it would give administrators access to real-time attendance data, which would simplify the tracking of attendance and enable data-driven decision-making . Large volumes of data would be handled by the system, which would be developed using machine learning and computer vision techniques.

All things considered, this project has the power to completely change how attendance is kept track of in a variety of places, including companies, colleges, and schools. It provides a very precise and effective solution that can lower expenses, save time, and boost output all around.

Keyword- Attendance Management System, Face Recognition, Camera, NumPy, OpenCV.

I. Introduction-

Handling attendance manually can be a laborious and time-consuming process in the fast-paced world of today. Furthermore, manually recording attendance can lead to erroneous statistics due to error-proneness. As a result, many organisations now require an automatic attendance management system based on facial recognition technology.

The goal of the "Face Recognition Based Attendance Management System" project is to create a system that efficiently and accurately marks attendance using computer vision and machine learning techniques. As people enter a specified region, the technology would take pictures of them and compare them to a database of people who have already registered. The system would record the person's attendance and save the data for further use after a successful identification.

Comparing this project to manual attendance monitoring, there are various advantages. Because it does not require human participation, there is a decreased possibility of mistakes and inaccuracies. Additionally, it gives administrators access to real-time data, allowing them to monitor attendance and make informed decisions. Large data volumes may also be handled by the system, which makes it perfect for offices, colleges, and schools.

Software development, computer vision, and machine learning skills are needed for this project's development. As a result, our initiative offers people a fantastic chance to advance their knowledge and obtain real-world experience in the artificial intelligence domain.

All things considered, the "Face Recognition Based Attendance Management System" project has the ability to completely change how attendance is tracked in a variety of organisations, improving accuracy, efficiency, and user convenience for both administrators and staff.

II. Literature Survey –

An automatic attendance system model was presented by the authors in [3]. The model focuses on how authorised pupils are identified and counted as they enter and exit the classroom using face recognition and Radio Frequency Identification (RFID). The system keeps the actual record of each enrolled student. Furthermore, the system keeps track of every student's details in the attendance log for a particular course and provides the necessary data as needed. The authors of this study [4] developed and implemented an attendance system using iris biometrics. The visitors have to register their information and iris template as a prerequisite. By taking a picture of each student's eye, recognising their iris, and searching for a match in the database that was created, the system automatically logged attendance in class. The prototype was the internet . An attendance system based on facial recognition was proposed by authors in [5]. 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.
The authors of [6] conducted research to obtain the best facial recognition algorithms from the Open CV, which are Eigenface and Fisherface.

2.4.8 and incorporated it into the attendance system by contrasting the Receiver Operating Characteristics (ROC) curve.The research done for this paper showed that Eigenface performs better than Fisherface, as seen by the ROC curve. The Eigenface algorithm system had an accuracy rate ranging from 70% to 90%.
In [7], authors proposed a facial recognition technique for a classroom attendance system using Discrete Wavelet Transforms (DWT) and Discrete Cosine Transforms (DCT). These methods were used to extract the characteristics from the student's face, and the objects on the face were then classified using the Radial Basis Function (RBF). This method yielded an accuracy percentage of 82%.

III. Proposed System-

After completing the registration form and giving the required information, pictures of each student in the class will be taken and included to the dataset. During each session, faces will be recognised from the live streaming video in the classroom. The faces that have been identified will be compared to pictures from the collection. If a match is found, the attendance of that student will be noted. At the end of each session, a list of those who did not show up will be mailed to the appropriate academic member in charge of the session.
The system architecture for the proposed system is given below:

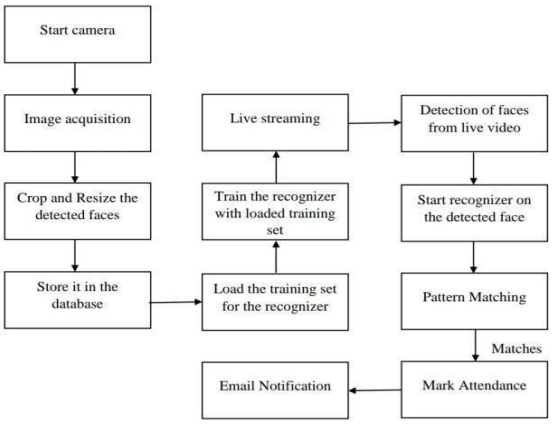

Fig.1. System Architecture

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 further utilised 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 versions. After that, a folder containing the names of each student will have these pictures saved in it.

2.Face Detection

Here, faces are detected using OpenCV and the Haar-Cascade Classifier. The Haar Cascade approach needs to be trained to detect human faces before it can be applied to face identification. This process is known as feature extraction. The training data for the haar cascade is contained in an xml file named haarcascade_frontalface_default. The haar features shown in Fig. 2 will be used for feature extraction.

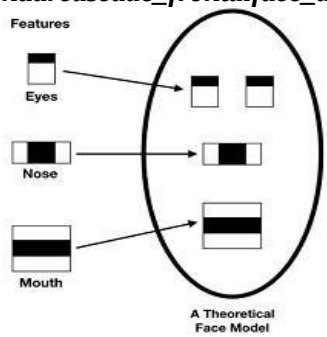

Fig.2. Haar Features

The OpenCV detectMultiScale module is being used in this instance.This is required in order to draw a rectangle around the faces in an image. The scaleFactor, minNeighbors, and minSize parameters are considered. Use the scaleFactor to determine how much a picture must be downsized in each image scale. MinNeighbors specifies how many neighbours each candidate rectangle can have. Higher levels usually result in better image quality but fewer faces being identified. minSize specifies the smallest possible object size. By default, it is (30,30) [8]. This system makes use of the scaleFactor and minNeighbors parameters, which have values of 1.3 and 5, respectively.

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 are created. One histogram will ultimately be created for each picture in the training set..The best matching label for the student to whom the face belongs is subsequently returned when the histogram of the face to be recognised 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.The pertinent faculties will then get a list of the absentees via mail. Faculty monthly attendance sheets will be updated at the end of each month.

IV.RESULTS AND DISCUSSIONS

Through a GUI, users can communicate with the system. Users will primarily have access to three options here: mark attendance, teacher registration, and student registration. In the student registration form,

students are expected to fill in all necessary information. Following the registration button click, the webcam launches automatically, displaying the window depicted in Figure 3 and beginning to recognise faces inside the frame. After then, it will begin taking pictures automatically until 60 samples are gathered or CRTL+Q is pushed. Following pre-processing, these photos will be kept in the training images folder. The faculty members are expected to fill out the faculty registration form with their email address and the appropriate course codes.This is significant since the corresponding faculties will eventually receive a list of those who are missing.

Fig.3. Face Detection

Each session requires the relevant faculty member to input their course code. The camera will then turn on automatically after the course code has been submitted. Figure 4 displays the facial recognition window where two enrolled students are identified; if the individuals hadn't registered, the window would have shown "unknown."
The window can be closed by hitting CTRL+Q. The names of those who are absent will be mailed to the appropriate faculty, and attendance will be updated in the excel sheet.

Fig.4. Face Recognition

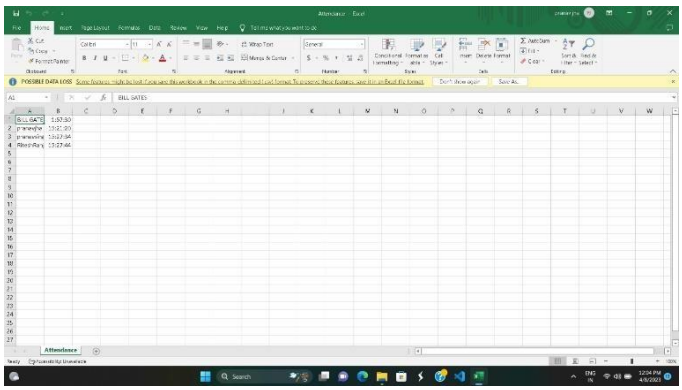

Fig.5. Attendance sheet

The attendance sheet updated following the recognition procedure is shown in Fig. 5. The marking system assigns a value of '1' to recognised students and '0' to absentee students. The corresponding faculty email address will receive a list of absentees through mail.

V. CONCLUSION

This system tracks student attendance in class effectively by using facial recognition algorithms. The suggested technology will be able to track attendance using Face ID. It will first recognise faces using a camera. The acknowledged student's attendance will be reported and the attendance record updated after acknowledgment.

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