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Attendance management system using face recognition

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ABSTRACT

Traditional attendance systems consist of registers marked by teachers, leading to human error and a lot of maintenance. Time consumption is a key point in this system. We wanted to revolutionize the digital tools available in today's time i.e., facial recognition. This project has revolutionized to overcome the problems of the traditional system. Face recognition and marking the present is our project. A database of all students in the class is kept in single folder, and attendance is marked if each student's face matches with one of the stored faces. Otherwise, the face is ignored and not marked for attendance. In our project, face detection (machine learning) is used.

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1. INTRODUCTION

Maintaining attendance is veritably important in all educational institutions. Every institution has its own system of taking pupil attendance. Some institutions use paper grounded approach and others have espoused automated styles similar as point biometric ways. Still, these styles subjects' scholars to stay in a line which consumes time and it's protrusive. Calculating capability over the once many decades now enable analogous recognitions automatically. Attendance plays an important part in any organisation whether it be educational institutions or companies. So, it's veritably important to keep record of the attendance. The problem arises when one must manually take the attendance which isn't only time consuming but exhausting as well.

Numerous techniques, including machine learning and deep learning, are used in this face recognition to analyze and capture photos of people's faces. Persons in real time images can be detected and identified using many facial recognition systems and facial recognition is a biometric method. In real world we use tit to unlock the phone and finding missing persons. Face detection can also be used for facial motion tracking, which is the process of deploying cameras or laser scanners to turn a human's face motions into a digital database [1]. Several algorithms have been reported in the literature reported in the domain of face recognition. The methods typically are the combination of feature extraction and classification methods. The eigen face algorithm has been one of the good approaches known as it extracts the necessary and important information from an image and the way it encodes it efficiently [2].

In digital photography, face recognition is a technology used in various programs to identify people's faces. In order to detect facial features from an image, the most advanced facial recognition system utilizes facial features. Students' photos are stored in a database along with their names in this study. It takes a picture of anyone standing in front of the camera and compares it with any previously stored images [3]. When it comes to manual methods of taking attendance, we can see that people can easily do alterations in it and it is easily accessible by most people, even manual methods consume the energy and time of the individual and can cause inefficient working schedules. The conventional method to call by name is time-consuming and there is always a chance of proxy attendance [4].

In this project face detection is not software based we will do full analysis of face and with more and more accuracy to stop proxy and to increase accuracy so less and less overlap and it match in a loop also store a loop of image so that easily mark attendance and also able to do effective way and it also save time, as many software like this are available in our reach but the change is to make a unique product and I think at the end of this paper you all are able to understand the uniqueness of this project. Face the discovery of face shapes, shapes and angles in images with sophisticated and background lighting and that feeds look of the back face [5]. We use an automatic management attendance system to solve all of these problems. There are numerous benefits to applying this technology, i.e:

- Automation improves time monitoring and eliminates the need for staff to monitor the system around the clock. With advanced automated methods, gross incompetence is reduced.
- With a rapid and precise identification technique, a time and attendance system that incorporates facial recognition technology can accurately report attendance, absence, and overtime. Facial recognition system can precisely track attendance records without any operator error [6].

In daily life, face recognition technology has been implemented in many aspects, especially on smartphone. For example, in Snapchat app, this application using face one's face and play as important role on artificial recognition that relate with the location and shape of the face location. There is one application that relate with application recognition that we call with Snapchat app. This technology is also applied as biometric authentication for a mobile security system, that become substitute of the fingerprint-based system. There are some technologies that used face ID on their peripheral which has an artificial face recognition sensor that becomes of two parts: a "Alpha" module that projects more than 10,000 infrared dots onto the user's face, and a "Beta" module that reads the pattern [7]. Attendance marking through face recognition is done by using a cam- era, which captures an image of class students.

Marking attendance through face recognition mainly involves two stages, first is face detection and second is face identification. Though this method has some limitations like accuracy and resources, this can be used to maintain attendance log easily and the analysis of student’s presence in class can be made easier. With improved technology resources and computation are no more limitations. Accuracy can be improved by using proper datasets for training, good environmental conditions for testing and also it can be improved by improving the algorithms used for face recognition [8]. Many face recognition techniques were introduced out of which we use, open-source computer vision library, NumPy, Python (Tkinter) so as to make our application runs faster.

2. METHOD

To successfully deploy a facial recognition monitoring attendance system, it is imperative to adhere to a set of well-defined rules and methodologies. These guidelines not only ensure the system's effectiveness but also guarantee ethical and privacy considerations are met. Implementing comprehensive data protection measures, acquiring informed consent from individuals, and regularly updating the technology to account for potential biases are some of the essential rules that must be rigorously followed in the development and use of such systems. Confined phases had to be achieved for this method: enrolling with unique IDs, creating data bases, face detection, training of faces, face recognition, and graphical user interface

2.1. Phase 1: enrolling with unique IDs

A person or student gets enrolled with their general data to the database. This data will later be stored for further processing. The picture of person will be captured with the use of digital digicam. After this phase, functions are extracted. Thus, precise functions may be stored in the database along side their precise ID [9].

2.2. Phase 2: creating data bases

Before the attendance management device can work, there's a set of information that has to be added to the system, which essentially contains the person's basic information, their ID, and their faces. The fundamental method of acquiring portraits could be carried out via the use of using the camera to record the subject's faces. In this way, the gadget will initially determine whether there is a face in the snapped picture.

When if there is no face identified, the system will prompt the user to take another picture of their face until it does a particular number of photos as a way to get a hundred required photos on this project for every student. The photos will next undergo a variety of pre-processing procedures to create a grayscale image and cropped faces from equal-sized images [10].

2.3. Phase 3: face detection

The primary data storage format for trained faces is .py, which acts as the foundation for the facial recognition system's operation. Through the utilization of a face recognition algorithm, the system first detects faces in the provided images or video streams. Subsequently, it undergoes two crucial decision-making processes as documented in face verification [11], which assesses if the detected face matches any of the trained faces, and Face or No face decision, which determines whether a face is present in the image or if there's no face detected. These distinct stages are pivotal in ensuring the system's accuracy and effectiveness.

2.4. Phase 4: training of faces

The images are saved in grayscale after being recorded by a camera. The local binary pattern histogram (LBPH) recognizer is used to teach these faces because the coaching sets the resolution and therefore the recognized face resolutions are completely variant. an element of the image is taken as the center and the neighbors are thresholded against it. If the depth of the middle element is greater or equal to its neighbor then it is denoted as 1 and 0 if not. this may result in binary patterns generally known as local binary pattern (LBP) code.

2.5. Phase 5: face recognition

The data of the trained faces are stored and the detected faces are compared to the IDs of the students and recognized. The recording of faces is done in real time to guarantee the accuracy of the system. This system is precisely dependant on the camera’s condition.

2.6. Phase 6: attendance marking

The key feature of this attendance system is its automatic attendance tracking, which occurs following the successful recognition of a student's face. If the system's face recognition process fails to identify a student, it will refrain from marking attendance for that individual. This system ensures efficient and accurate attendance management, only recording attendance when a recognized face is detected [12].

2.7. Phase 7: graphical user interface

The graphical user interface (GUI) is developed the usage of Python tkinter module. We created five Textboxes where we enter our input biological parameters and 2 buttons for 'Prediction' and 'Exit'. When we click on the predict button, the values we entered are fed to the model loaded and the labeled output is shown at the textual content container similar to emotion [13].

2.8. Flowchart

A diagram that shows a process is called a flowchart. Used to understand the logic and decision-making processes and to visualise the sequential flow of a process. Used to understand a process's reasoning and steps. The flowchat of a system is shown in Figure 1.

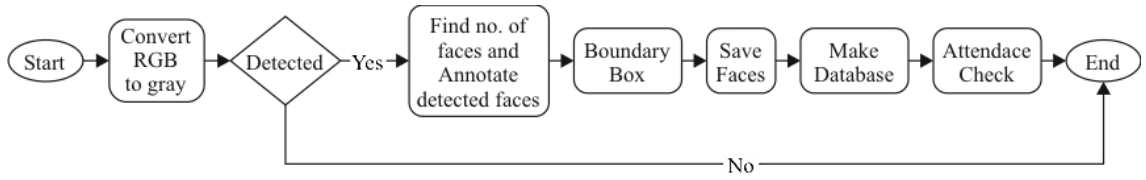

Figure 1. Flow chart of face recognition process [14], [15]

3. RESULTS AND DISCUSSION

The face detection method is trained by different positive and negative images. 100 samples are taken and window.geometry('1280x720') is used in this work. The number of positive samples taken is 60. From the confusion matrix, the accuracy and precision are calculated.

Accuracy = (TP+TN)/Total = 0.87 = 87%

Precision = TP/(TP+FP) = 0.89 = 89% [16]–[19]

The essential operating precept of the assignment is performed by the photographs are taken and spot them. Further, the recognized photo of the individual is supplied with attendance with time and date. The following findings have been obtained for the application of face recognition [20], [21].

3.1. User interface

The first window through which to enter the main window of the system is shown in Figure 2. When your login, it goes to the main window of the attendance system, through which the left side of button is for registration. After that, the button is for face recognition and third is for attendee marking, the right one button is for exiting the app [22], [23].

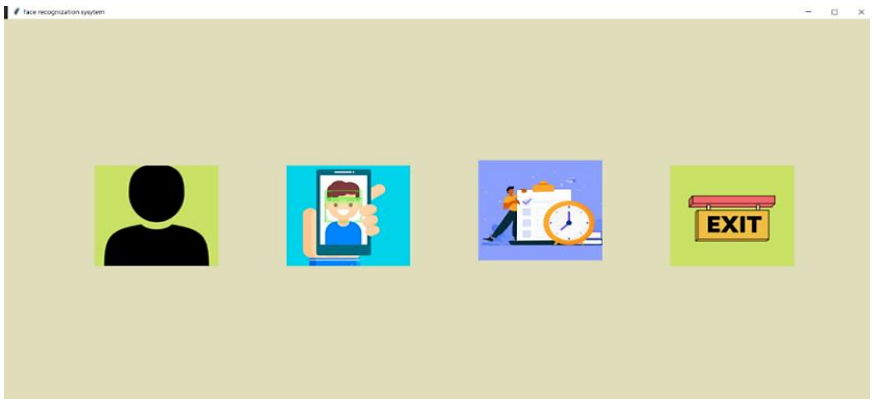

Figure 2. GUI of software

3.2. Face recognition

Face recognition method, checking out the pictures. In the recognition stage, the machine compares the captured image with the archive image. If the machine becomes aware of the specific pictures with the stored image, then the faculty can see the ID number and name of the particular student as shown in Figure 3 [24].

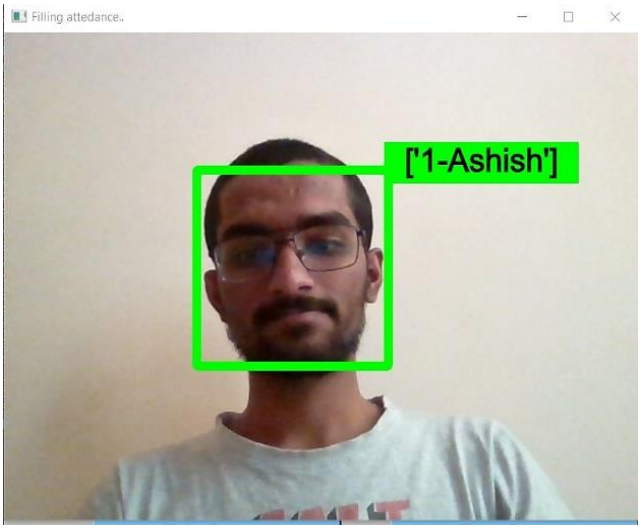

Figure 3. Face recognization

3.3. Train images

Captured images of a person are trained along with the details of the person one by one with the counting method. After training, it is stored in a particular folder named training images. Various positions of face images are captured as shown in Figure 4 [25].

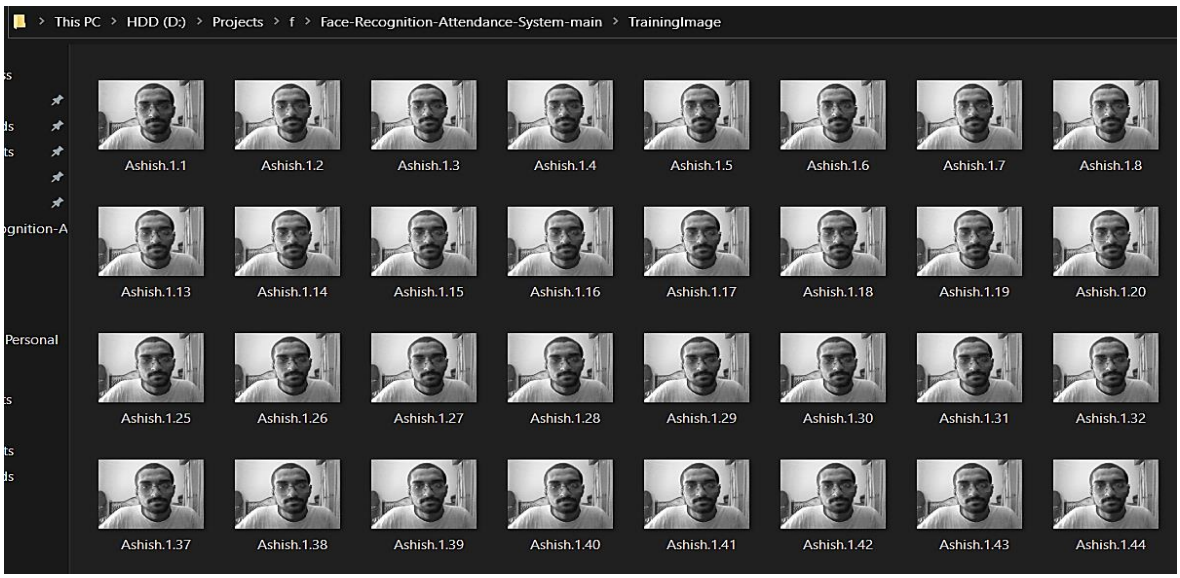

Figure 4. Training images

4. CONCLUSION

Based on this face detection and recognition can be used to implement so many applications like automatic attendances system based on face recognition, worker attendance, security, safety, and police application like finding a thief in the image that help to catch a thief. In this system, we have implemented an attendance system for a lecture, section, or laboratory by which the lecturer or teaching assistant records students' attendance. It saves time and effort, to keep records of students especially if it is a lecture with a huge number of students. This attendance system shows the use of facial recognition techniques for student attendance and for the further process this record of students can be used in exam-related issues.

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