

Face recognition-grounded attendance monitoring system for educational institution

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Abstract :

The main purpose of this design is to make a face recognition-grounded attendance monitoring system for educational institution to enhance and upgrade the current attendance system into more effective and effective as compared to ahead. The current old system has a lot of nebulosity that caused inaccurate and hamstrung of attendance taking. numerous problems arise when the authority is unfit to apply the regulation that live in the old system. This system leverages state- of- the- art facial recognition technology, enforced through the Python programming language and the OpenCV library By using advanced facial recognition technology, this system offers a largely effective and dependable result to streamline the attendance operation process.

Keywords: *Smart Attendance System, Face Database, Face Recognition Algorithm, Data Storage, Automated Reporting, OpenCV, Numpy.*

1. Introduction :

Traditional manual methods for recording attendance often suffer from address these challenges and enhance the overall attendance management process, we introduce the “Face Recognition-Based Attendance Monitoring System”. In this chapter, we will discuss about the problem, motivation, research objectives, project scope, project contributions and the background.

1.1. Problem Statement : The traditional methods of attendance tracking in educational institutions, such as paper-based registers or card swiping systems, suffer from several inherent limitations that hinder efficiency and accuracy. These issues include - Time-consuming, Proxy attendance, Inaccuracies, Administrative burden.

1.2. Motivation : The motivation behind developing the Face Recognition-Based Attendance Monitoring System for Educational Institutions project is to address these pressing issues and harness the advantages of facial recognition technology. The following factors motivate the development of this system - improved security, preventing unauthorized access and proxy attendance, offers a high level accuracy, reliability and easy to accessibility.

1.3. Research Objectives : The crucial objects of the Face Recognition-Grounded Attendance Monitoring System for Educational Institutions design are as follows :

- To develop a movable Smart Attendance System which is handy and tone- powered.
- Have enough memory space to store the database.
- To insure the speed of the attendance recording process is faster than the former system.
- Suitable to fete the face of an individual directly grounded on the face database.
- Give a stoner-friendly interface for admins to pierce the attendance database.
- Develop a database for the attendance operation system.

1.4. Project Scope and Direction : The main intention of this design is to break the issues encountered in the old attendance system. The entourages are the design scopes

- Robotization of the attendance recording process, icing that attendance is marked in real- time during sessions
- The facial recognition process can only be done for 1 person at a time.

- An excel distance is created which contains the pupil attendance.
- The design has to work under a Wi- Fi content area or under Ethernet connection, as the system need to modernize the database of the attendance system constantly.

1.5. Contributions : The “Face Recognition-Grounded Attendance Monitoring System For Educational Institution” project makes several valuable contributions :

- It contributes to the advancement of facial recognition technology .
- It promotes accountability among students and staff by minimizing opportunities for fraudulent attendance.
- It saves a lot of cost in the sense that it had eliminated the paperwork completely.

2. Literature :

Attendance System Using NFC Technology with bedded camera on mobile device according to exploration journal “ Attendance System Using NFC(Near Field Communication) Technology with Bedded Camera on Mobile Device ”(Bhise, Khichi, Korde, Lokare, 2015). The attendance system is bettered by using NFCtechnology and mobile operation. According to the exploration paper, each pupil is given a NFC label that has a unique ID during their registration into the council. Attendance of each class will also be taken by touching or moving these markers on the speaker mobile phone. The bedded camera on the phone will also capture the pupil’s face to shoot all the data to the council garçon to do confirmation andverification. However, this system couldn’t automatically spot the violation when the NFC label isn’t tête-à-tête tagged by the original owner. However, utmost of the speaker won’t probably to prefer their particular smart phones to be used in this way due to sequestration matter, If the attendance to be recorded? also. Hence, unique information about the pupil like biometrics or face recognition, which is guanine for a pupil should be used in relief of the NFC label. This will insure attendance to be taken firstly by the factual pupil.

3. Face Recognition-Grounded Attendance Monitoring System For Educational Institution :

Alternate exploration journals “Face Recognition Based Attendance Marking System” (Senthamil Selvi, Chitrakala, Antony Jenitha, 2014) is grounded on the identification of face recognition to break the former attendance system's issues. This system uses camera to capture the images of the hand to do face discovery and recognition. The captured image is compared one by one with the face database to search for the worker's face where attendance will be marked when a result is set up in the face database. The main advantage of this system is where attendance is marked on the garçon which is largely secure where no one can mark the attendance of other. But this type of system is only suitable for marking staff's attendance as they only need to report their presence formerly a day, unlike scholars which bear to report their attendance at every class on a particular day, it'll be inconvenient if the attendance marking system isn't movable .

4. Fingerprint Based Attendance System Using Micro controller and Lab View :

The third exploration journal “ Fingerprint Based Attendance System Using Microcontroller and LabView ”(Kumar Yadav, Singh, Pujari, Mishra, 2015) proposed a result of using point to mark the attendance. This system is using 2 microcontrollers to deal with the point recognition process. Originally, the point pattern will be attained through a point detector , also the information will be transmitted to microcontroller 1. Coming microcontroller 1 will pass the information to microcontroller 2 to do the checking with the database that resides in it. After chancing a pupil's match, the details are transferred to the PC through periodical communication to be displayed. But again, this system is attached to a PC which make it not movable . Other than that, the database information cannot be accessible fluently.

5. RFID based Student Attendance System :

According to the fourth exploration journal “ RFID grounded Student Attendance System”(Hussain, Dugar, Deka, Hannan, 2014), the proposed result is nearly analogous to

the first exploration journal where RFID technology is used to ameliorate the aged attendance system. In this system, a label and an anthology is again used as a system of tracking the attendance of the scholars. The difference between the first journals with this is where attendance's information can be penetrated through a web gate. Again, this system is a miss in the sense that, originally, it isn't movable, as the RFID anthology can only work when it's connected to a PC. Secondly, the RFID label isn't a genuine information that can uniquely identify a pupil, therefore, performing in the trip of the collected attendance information.

6. System Design :

The design part of the "Face recognition- grounded attendance monitoring system for educational institution" is divided into two sections which correspond of the hardware and the software part.

6.1. Hardware Development :

- Camera Module with good mega pixels.
- Power Supply Cable.
- 16Gb Micro SD Card.

6.2. Libraries Development :

OpenCV : Open CV, which stands for "Open Source Computer Vision Library" , is an open- source computer vision and machine literacy software library. It provides a wide range of tools, algorithms, and functions for colorful computer vision tasks, including image and videotape processing, object discovery and recognition, facial recognition, and more. OpenCV is written in C and offers tapes for colorful programming languages, including Python, Java, and MATLAB, making it extensively accessible to inventors across different platforms

OpenCV's application areas include:

- 2D and 3D point toolkits
- Facial recognition system

- Gesture recognition
- Mobile robotics
- Motion understanding
- Object identification

6.3. Operating System Support:

OpenCV runs on the desktop operating systems - Windows, Linux, macOS, FreeBSD, NetBSD and OpenBSD as well as mobile operating systems Android, iOS, Maemo, BlackBerry 10 and QNX.

6.4. NumPy :

NumPy, which stands for “Numerical Python,” is a fundamental Python library for scientific computing and numerical operations. It provides support for handling large, multi-dimensional arrays and matrices, along with an extensive collection of mathematical functions to operate on these arrays efficiently. NumPy forms the foundation for many other Python libraries in the scientific and data analysis ecosystem.

7. Methodology : Before the attendance operation system can work, there are a set of data demanded to be inputted into the system which basically correspond of the individual's introductory using the Camera to capture the faces of the existent. In this process the system will first descry the presence of a face in the captured image, if there are no face detected, the system will prompt the stoner to capture their face again until it meets certain number of pictures which will be 10 needed pictures in this design for each pupil. The decision of storing only 10 portrayal per pupil is due to the consideration of the limited storehouse space in the jeer pi because the total quantum of scholars procedures to gain a grayscale image and cropped faces of equal sized images because those are the prerequisites of using the EigenFaces Recognizer. Both of the processes mentioned over can be represented in the illustration below.

7.1. Image Acquisition and Pre-processing procedures :

After the images are being reused, they're stored into a train in a scale manner. In this design, all the faces will be stored in a scale manner under the „ database “brochure. When expanding through the database brochure, there will correspond of numerous sub-folders which each of them will represent an existent where a series of face portrayal belonging to the same existent will be stored in that particular sub-folder. The subfolders that represent each existent will be named upon the ID no. of that existent which is unique for every single existent in the institution. The whole process of image reclamation, pre-processing, storing medium is done by the script named `create_database.py`.

7.2.Hierarchy manner of the face database :

After a successful reclamation of facial images into the separate brochure, a CSV lines created to prop the coming process of pumping the faces into the recognizer for the training process. The creation of the CSV train will be done grounded on a script named `create_csv.py`. Structure of the content in the csv train After having sufficient images in the database, those training medium handed in OpenCV3.4 which are EigenFaces, FisherFaces, and Original double Patterns Histograms(LBPH). The recognizer that will be concentrated in this design will be the EigenFaces recognizer. The conception behind EigenFaces is simple – it recognizes a particular face by catching the maximum divagation in a face and also turning those linked variations into information to be compared when a new face arrives. In the training process, the csv train will be read to give the path to all of the images where those images and markers will be loaded into a list variable. Also, the list will be passed into the training function where the training process will take a measurable time to run.

Conclusion :

The implementation of a “Face recognition- grounded attendance monitoring system for educational institution” has addressed several significant issues that were prevalent in the old attendance tracking methods. These issues included inaccuracies, inefficiencies, and administrative challenges.

The facial recognition system has effectively eliminated these problems and introduced several advantages:

The new system ensures highly accurate attendance tracking by relying on facial recognition technology, reducing the chances of errors or inaccuracies in attendance records.

Automation through facial recognition streamlines the attendance-taking process, saving time and effort for both students or employees and administrative staff.

The primary cost involved in implementing this solution is the storage space required for the facial image database. Fortunately, modern storage solutions like micro SD cards can easily accommodate this data volume.

The project successfully created a face database, allowing for efficient enrollment and recognition of individuals.

References :

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OpenCvDocumentation -<https://opencv.org>

Numpy - <https://numpy.org>