Flask Based Face Recognition System for Attendance

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Abstract: *The main aim of this project is to build a face recognition based attendance system for educational institution to upgrade the current attendance system into more efficient and effective manner. The current system provides inaccurate and inefficient results of attendance taking. The new technology that helps this problem to overcome is face recognition system. The human face is the natural entity that uniquely identify a person. In this project, face databases are created and during, attendance taking, the faces are compared with the already existing faces in the databases. If the person is identified, the attendance will be taken automatically by saving the necessary information in the excel sheet.*
Keywords: *Smart attendance system, NFC, RFID, OpenCV, NumPy.*

I. INTRODUCTION

According to previous attendance system, the attendance taking is manual and it provide inaccurate results. To avoid this, face recognition system is developed. A face recognition attendance system make use official recognition technology to identify and verify a person and mark attendance automatically. Fingerprint scanning systems are almost the standard for attendance systems but recent struggle with the pandemic has brought the issue with the systems that require physical contact. So, a face recognition attendance system is a contactless technology that provides freedom from any physical interaction between the man and the machine. It is much easier to understand how attendance systems with face recognition works. A face recognition system captures and compares patterns on a person's face and analyses the details to identify and verify the individual.

II. IMPORTANCE AND ADVANTAGES

1. Automated time tracking system: Entry and exit time monitoring done manually or with other biometric systems can be fully automated with facial recognition attendance system. There is no need for human intervention or physical validation as the system's advanced algorithms can locate and identify faces autonomously. It is effortless to track time for students with facial recognition.

2. Cost-effective: A facial recognition attendance system can save business resources by automatic student time tracking. The cost savings are even higher as data received from the face recognition attendance system is in real-time and valid.

3. Touchless sign-in system: Pandemic like covid 19 can be better managed by minimising physical contact in work environments. Post pandemic there has been a significant increase in demand and adoption of contactless technologies.

4. Easy to manage: As compared to manual attendance systems, AI-based attendance system are highly automated. These systems store and update day-to-day records in real-time. From maintaining daily attendance to preparing high-accurate timesheets of individual student, facial recognition attendance systems are programmed to handle it all on a very large scale.

III. WORKING OF FACE RECOGNITION

1. **Face Detection:** To recognise a face, it is first important that we detect/locate a face in an image. There are various facial detection softwares that can detect a human face in an image. We extract a human face and then move on to the next step. Viola Jone algorithm is one of the most popular face detection algorithms.

2. **Feature extraction using face embedding:** The next step is to extract features from a face using a face embedding model. A face embedding is a vector that represents the features extracted from the face and we can use these vectors to recognise faces. We get a face embedding after passing the image through a face embedding model.

3. **Facial recognition:** We have face embedding for each face in the system. Whenever we pass a new face to the system, it calculates its face embedding and compares it with the ones we already have. The face is recognised, if its face embedding closely matches any other face embedding in the databases.

IV. HARDWARE DEVELOPMENT

1. Camera module with good mega pixels.
2. Power supply cable
3. 16GB micro SD card

V. LIBRARIES DEVELOPMENT

1. OpenCV: OpenCV is an image and video processing library and is used for image and video analysis, like facial detection, license plate reading, photo editing, advanced robotic vision, optical character recognition and a whole lot more.

Advantages of Open CV:
- Open CV is an open source library and is free of cost.
- As compared to other libraries, it is fast since it is written in C/C++.
- It works better on system with lesser RAM.
- It supports most of the operating systems such as Windows, Linux and MacOS.

2. dlib: The lib library, maintained by Davis King, contains our implementation of "deep metric learning" which is used to construct our face embedding used for the actual recognition process.

3. Face_recognition: The face_recognition library, created by Adam Geitgey, wraps around lib's facial recognition functionality, and this library is super easy to work with. Remember to install lib library first before you install face_recognition.

4. NumPy: NumPy is the fundamental package for scientific computing in Python which provides a multidimensional array object other mathematical operations can be performed using this but simply specking we just need it to convert our images into some form of an array so that we can store the model that has been trained.

5. Haar Cascade: Haar Cascade is basically a classifier which is used to detect the objects for which it has been trained for, from the source. The result is an XML file which stores the trained result. If said simply the Haar Cascade is trained by superimposing the positive images over a set of negative i9mages. The training requires a high space system and a good internet connection and thousands of training images that is why it is carried out in the server. For increasing the efficiency of the results they use high-quality images and increase the number of stages for which the classifier is trained.We need hear cascade frontal face recogniser to detect the face from our webcam.

VI. METHODOLOGY
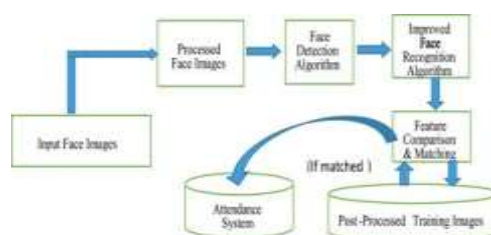
Flow chart of the image acquisition process
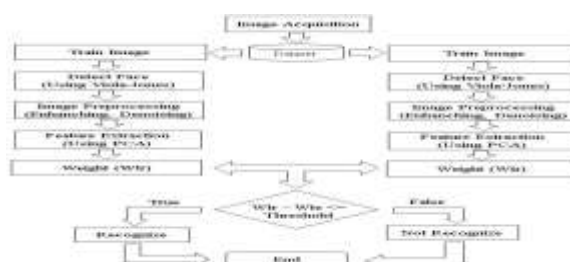
VII. RESULTS

VIII. CONCLUSION

Face recognition attendance systems are modern utilities that are a requirement of even the post-pandemic era. These systems make students attendance tracking accurate while saving costs. Such a system also adds a layer of security in the workplace. Facial recognition systems are the best modern-day solution for tracking student attendance hours.

If your organisation is still burdened by a manual attendance system, it's time to upgrade to a facial recognition attendance system.

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