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Face Recognition Based Attendance System Using Machine Learning

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Abstract: Automatic face recognition (AFR) technologies have made many improvements in the changing world. Smart Attendance using Real-Time Face Recognition is a real-world solution which comes with day to day activities of handling student attendance system. Face recognition-based attendance system is a process of recognizing the students face for taking attendance by using face biometrics based on high - definition monitor video and other information technology. In my face recognition project, a computer system will be able to find and recognize human faces fast and precisely in images or videos that are being captured through a camera. Numerous algorithms and techniques have been developed for improving the performance of face recognition but the concept to be implemented here is Machine Learning. It helps in conversion of the frames of the video into images so that the face of the student can be easily recognized for their attendance so that the attendance database can be easily reflected automatically.

Keywords: Face recognition, Face detection, Machine Learning, attendance system.

1. PROBLEM STATEMENT:

Attendance is an important part of daily classroom evaluation. At the beginning and ending of class, it is usually checked by the teacher, but it may appear that a teacher may miss someone or some students answer multiple times. Face recognition-based attendance system is a problem of recognizing face for taking attendance by using face recognition technology based on highdefinition monitor video and other information technology.

The concept of face recognition is to give a computer system the ability of finding and recognizing human faces fast and precisely in images or videos. Numerous algorithms and techniques have been developed for improving the performance of face recognition. Recently Deep learning has been highly explored for computer vision applications. Human brain can automatically and instantly detect and recognize multiple faces. But when it comes to computer, it is very difficult to do all the challenging tasks on the level of human brain. The face recognition is an integral part of biometrics. In biometrics, basic traits of human are matched to the existing data. Facial features are extracted and implemented through algorithms, which are efficient and some modifications are done to improve the existing algorithm models. Computers that detect and recognize faces could be applied to a wide variety of practical applications including criminal identification, security systems, identity verification etc. The face recognition system generally involves two stages:

- Face Detection – where the input image is searched to find any face, then image processing cleans up the facial image for easier recognition.

- Face Recognition – where the detected and processed face is compared to the database of known faces to decide who that person is.

2. Literature Review:

i. Fingerprint Based recognition system:

In the Fingerprint based existing attendance system, a portable fingerprint device need to be configured with the students fingerprint earlier. Later either during the lecture hours or before, the student needs to record the fingerprint on the configured device to ensure their attendance for the day. The problem with this approach is that during the lecture time it may distract the attention of the students

ii. RFID (Radio Frequency Identification) Based recognition system:

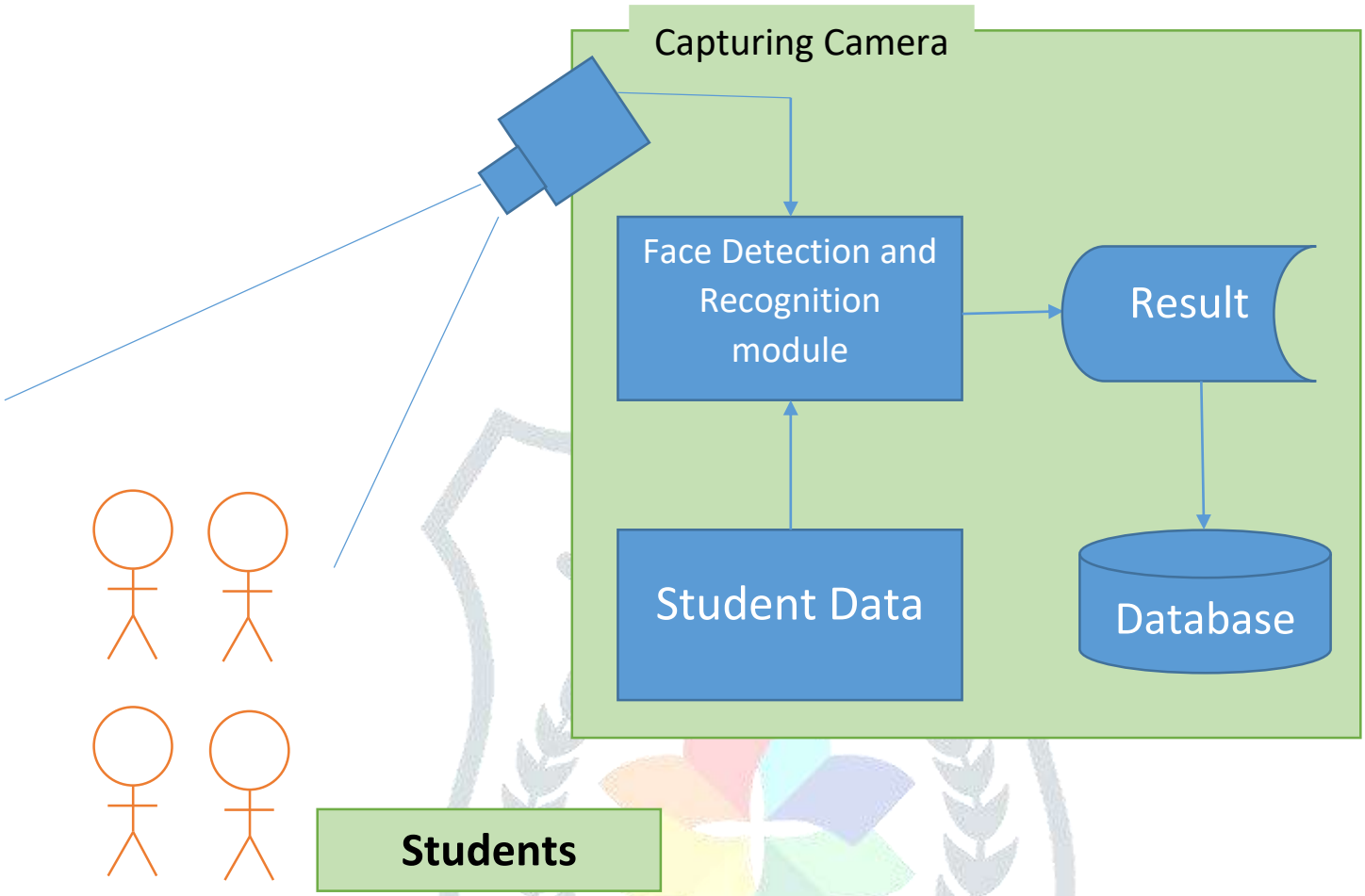
In the RFID based existing system, the student needs to carry a Radio Frequency Identity Card with them and place the ID on the card reader to record their presence for the day. The system is capable of to connect to RS232 and record the attendance to the saved database. There are possibilities for the fraudulent access may occur. Some are students may make use of other students ID to ensure their presence when the particular student is absent or they even try to misuse it sometimes.

3. Methodology:-

The proposed system face recognition-based attendance system can be divided into five main modules. The modules and their functions are defined as follows.

a. Image Capture

The high-resolution camera which is used for capturing video is used to take frontal images of the students.


Capturing Camera
Face Detection and Recognition module
Result
Student Data
Database
Students

b. Pre-processing:

The images are converted from RGB to Grayscale and are scaled down by a factor of 1.2.

c. Face Detection:

A proper and efficient face detection algorithm always increases the performance of face recognition systems. Various algorithms are proposed for face detection such as face knowledge based methods, feature invariant methods, machine learning based methods. In this project, I implemented a system for locating faces in digital images. These are in JPEG format only. Before we continue, we must differentiate between face recognition and face detection. They are not the same, but one depends on the other. In this case face recognition needs face detection for making an identification to "recognize" a face. I will only cover face detection. Face detection uses classifiers, which are algorithms that detects what is either a face (1) or not a face (0) in an image.

d. Developing a dataset

The faces detected in images are stored in the database after pre-processing and detection. A minimum of 20 images are captured per individual student along with a unique ID. The dimensions of these stored images are 212×212 pixels. These images are later used to train the recognizer.

e. Face Recognition:

Local Binary Pattern (LBP) is a smooth & adequate operator, which operates by setting the pixels of an image by thresholding the neighborhood of each pixel and examines the outcome as a binary number. Histogram of Oriented Gradients (HOG) descriptor increases the detection performance when combined with LBP. Therefore, a combination of LBP & HOG which gives LBPH algorithm is used for face recognition.

4. Algorithm:

Major Machine Learning Concepts going to be used: -

1. Create a data model of students face
2. Face detection of a student
3. Then recognize the given face
4. Compare the recognize face with the data base
5. If face is matched then mark attendance and send notification to parents
6. If face doesn't match prompt user to register for face

Tools required:-

1. Python
2. OpenCV
3. TensorFlow Library for training Neural Networks.
4. NumPy

Conclusion:

Thus, the aim of our project is to capture the images of the students, convert it into frames, relate it with the database to ensure their presence or absence, mark attendance to the particular student to maintain the record. The Automated face Recognition Attendance System helps in increasing the accuracy and speed ultimately achieve the high-precision realtime attendance to meet the need for automatic classroom evaluation. This system is designed to minimize the human effort for taking the attendance manually that take place in every college. As the attendance marking process is done without any human interference, which is the main scope in the system.

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