Attendance using Facial Recognition in Machine Learning

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Objective: To build a Facial Recognition System to record the attendance of students and staff, using python libraries.

Theory: Facial Recognition using Python Libraries - An easy way to detect faces, using Python, is by using the OpenCV package which is written in C/C++. OpenCV now provides bindings for Python. It uses machine learning algorithms to search for faces within a picture. Faces are very complicated, made up of thousands of small patterns and features that must be matched. The facial recognition algorithms break the task of identifying the face into thousands of smaller, bite-sized tasks, each of which is easy to solve, known as classifiers. A face may have 5000 or more classifiers, all of which must match for a face to be detected. Since there are at least 5,000 or more tests per block, we might have millions of calculations to do, which makes it a difficult process. To solve this, OpenCV uses cascades. The OpenCV cascade segments the problem of detecting faces into multiple stages. It performs a detailed test for each block. The algorithm can be performed on around 30 to 50 of these stages or cascades, and it will only detect a face, only when all stages pass. The cascades are a bunch of XML files that contain OpenCV data, used to detect objects.

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

Image Capture: The camera is fixed at a distance from the entrance, to capture the frontal image of the students. The remaining process goes for face detection.

Face Recognition: A proper and efficient face detection algorithm always increases the performance of a face recognition system. Various algorithms are proposed for face detection such as face knowledge based methods, feature invariant methods, machine learning based methods. In this project, I intend to implement 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. While they are not the same, one method depends on the other. In this case face recognition needs face detection for making an identification to “recognize” a face. Face detection uses classifiers, which are algorithms that detect either a face(1) or not a face(0) in an image.

Pre-Processing: The detected face is extracted, subjected to pre-processing. The pre-processing stage involves the histogram equalization of the extracted face image and is resized to 100x100.Histogram Equalization is the most common technique in Histogram Normalization. This improves the contrast of the image as it stretches the ranges of the intensities in an image, by making it more perfect.

Database Development : In this Biometric based system, collection of every individual is required. The database development phase consists of image capture of every individual student and extracting the Biometric feature for every individual. In our proposed system it is face, and after it is enhanced using pre-processing techniques, will be stored in the database

Post -Processing : In the proposed system , after recognizing all faces of the students, the names of individuals are updated into an excel sheet created by the exporting mechanism present in the database. The database also has the ability to generate monthly and weekly reports of student attendance. These generated records can be viewed by the faculty and students .This ensures that students whose Faces are not recognized correctly by the system have the chance to send a request to admin, giving the ability to correct the system and make it more accurate.

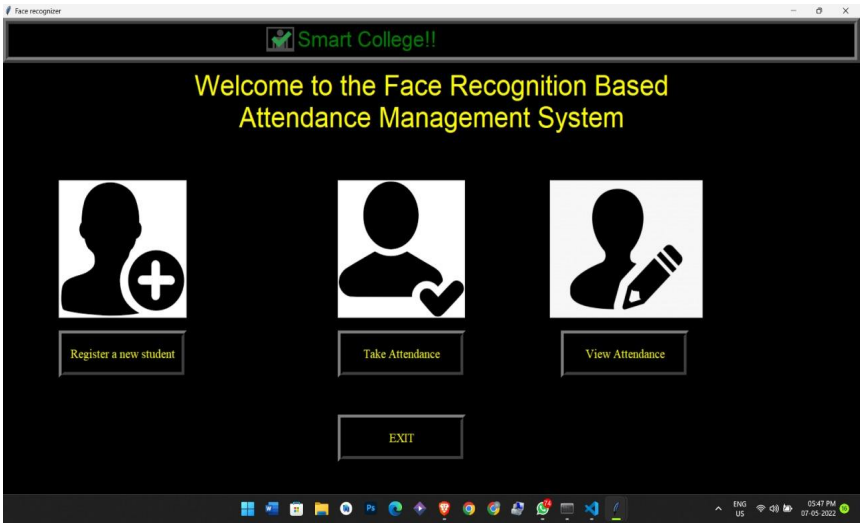
Proposed Algorithm:

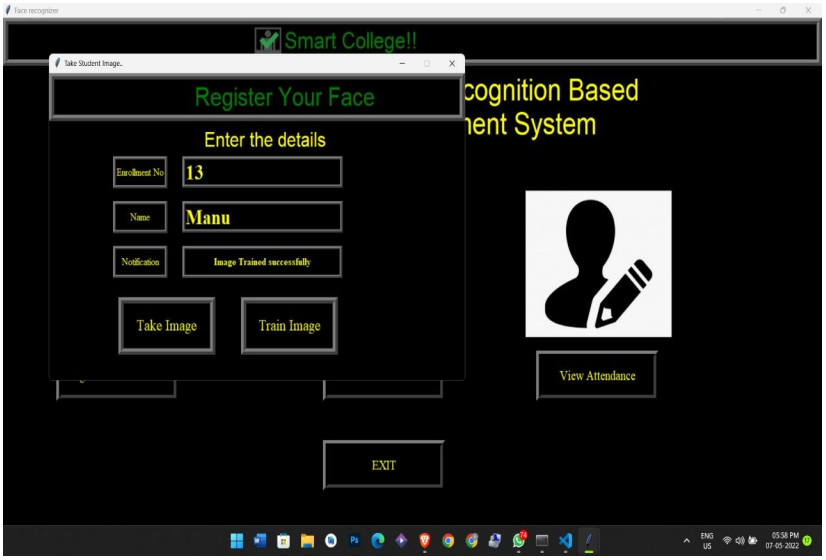
1. Capture the student's image through a camera.
2. Detects each and every individual face, by applying a face detection algorithm.
3. Extract the ROI(Region Of Interest) in a rectangular bounding box.
4. Convert to grayscale, apply histogram equalization and resize to 100x 100 i.e. apply pre-processing.
5. If image captured, then Store in database

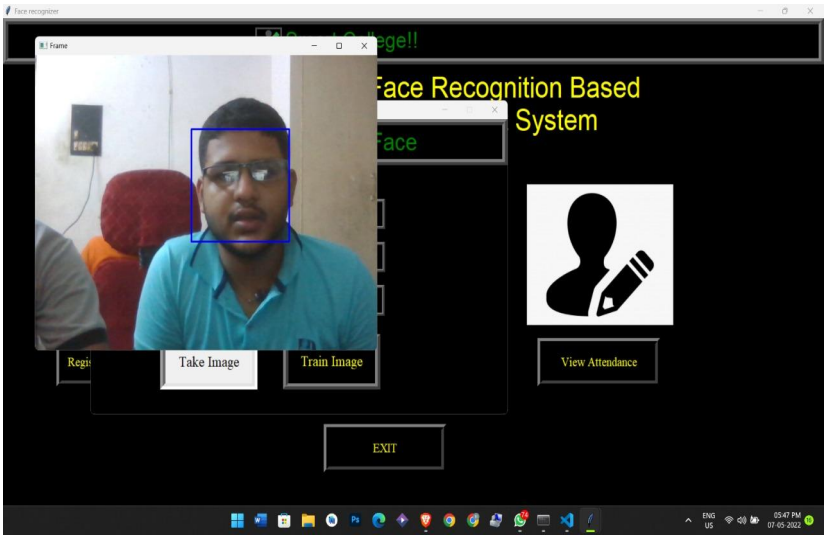
End if

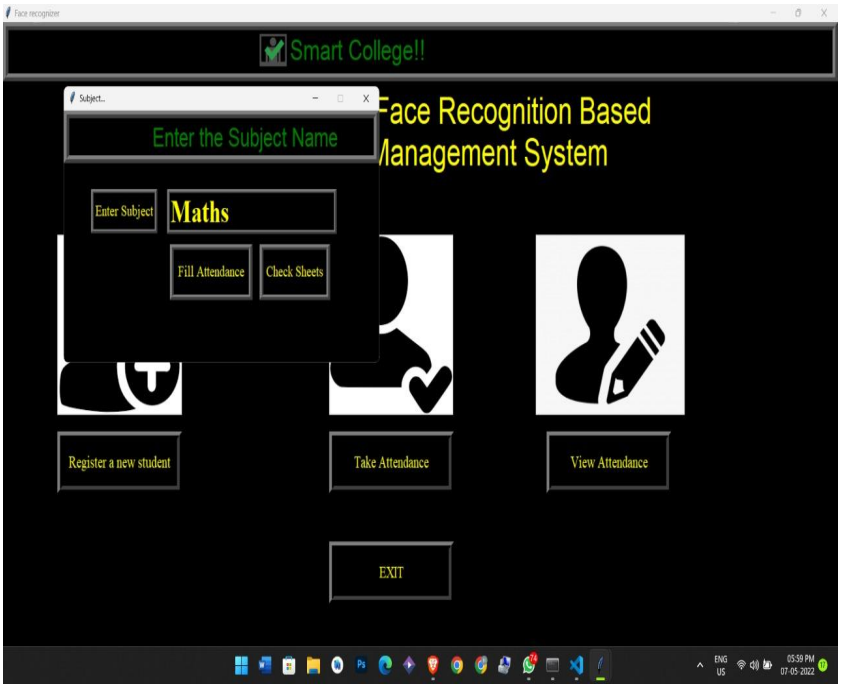
6.Post-processing

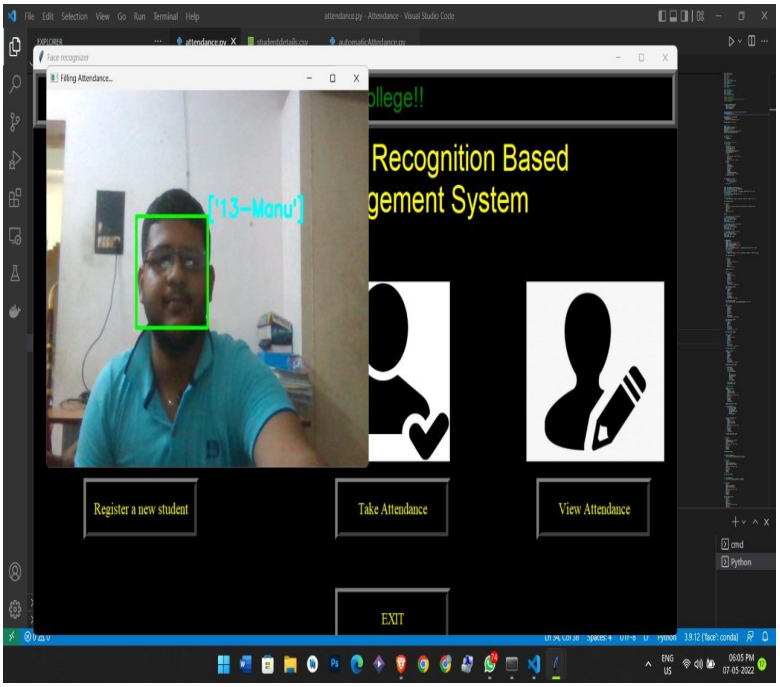
Sample:




Face recognizer
Smart College!!
Take Student Image..
Register Your Face
Enter the details
Enrollment No
13
Name
Manu
Notification
Image Trained successfully
Take Image
Train Image
cognition Based
nent System
View Attendance
EXIT


Face recognizer
Frame
Face Recognition Based
System
Face
Take Image
Train Image
View Attendance
EXIT


Face recognizer
Smart College!!
Subject..
Enter the Subject Name
Enter Subject
Maths
Fill Attendance
Check Sheets
Face Recognition Based
Management System
Register a new student
Take Attendance
View Attendance
EXIT



Future Scope/Any developments that can be made: We can add an algorithm that can actually calculate the attendance percentage and can send the same as a notification to their respective parents.