Face Recognition based Attendance System

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***Abstract*—While humans are very efficient at identifying familiar faces, they are not as skilled at dealing with many unfamiliar faces. Facial recognition is a method of identifying or confirming an individual's identity using their face. Facial recognition systems can be used to identify people in photos, videos or in real time. Our goal is to build an attendance system using facial recognition technology because the existing manual attendance system is time consuming, high-maintenance and prone to proxy attendance or human error. This system is implemented in four stages – database creation, face detection, face recognition and attendance update. Student images are already stored in the database. Face location is detected from live streaming video in the classroom. This detected face location is further coded to compare with images stored in the database to recognize a specific student. The name of the said student will be stored in the excel sheet along with their time of entrance.**

Keywords— Face detection, Face recognition, encoding, attendance system, database, OpenCV

I. INTRODUCTION

The traditional method of attendance marking is a tedious and time taking process as faculties have to call out each student's name and mark the attendance manually. This is time consuming, especially if there is a huge strength of students and hence increases the chances of errors. There are also chances of proxies or false signatures. An automated attendance system reduces these possibilities of human errors, is more efficient and fills out the time of the entrance of the students accurately. A Face recognition system can also beused in places of work to mark the employee's attendance. Many institutes and workplaces use other techniques to record attendance, such as radio frequency identification (RFID), fingerprint recognition, iris recognition, and more. However, these systems can be less efficient and can be intrusive in nature. This is where the facial recognition system comes into play. Two important processes in face recognition are verification and identification. Verification is a process known as a 1:1 matching system, as the system tends to compare an individual's facial biometrics with reference biometrics already on file. Identification is a process also known as a 1:N matching system. The system tends to identify an unknown person or an unknown biometric. The basic pipeline for face recognition:

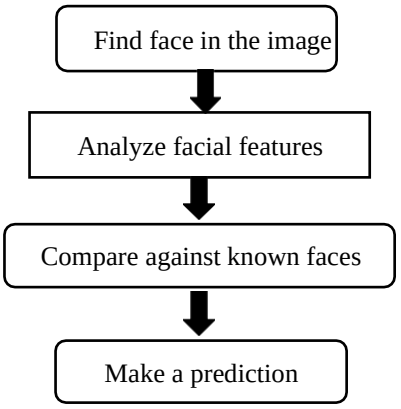


Fig.1 Basic pipeline for face recognition

In this paper, we implement python along with libraries/modules OpenCV, NumPy, Face recognition, operating system and datetime to perform facial detection and recognition. If the detected face from the live streaming video is found in the database, the attendance will be marked automatically.

II. LITERATURE REVIEW

Besides the traditional method of marking attendance i.e., pen and paper or signing attendance sheets, the existing work done in the attendance verification system includes:

A. RFID (Radio Frequency Identification)-based Attendance System

In this system, the students need to carry an RFID tag containingunique information about name/ID number/class etc. By placing their ID cards on the reader, students can immediately verify their attendance. The disadvantage of this system is that an unauthorized person can use an authorized ID and enter the organization. Students can use another student ID to verify their presence in the absence of a real student.

B. Iris Recognition based attendance system

B. Iris Recognition Based Attendance System Iris is a biometric that can be used for attendance systems. Participants register by saving their data along with a unique iris template. The system automatically takes class attendance by capturing an image of each participant's eyes, recognizing their iris and searching for a match in the database created. Due to the unique properties of the iris, it is extremely difficult to produce a reading from an iris scanner. The

major con of this system is that the person has to be at a close distance from the scanning device and stay steady in front of it to complete the scanning process. This means that this device cannot be used as a facial recognition device to scan anyone, regardless of their distance and movements.

C. Fingerprint based Attendance System

This system consists of a portable fingerprint scanning device that students can be passed around and students can place their finger on the sensor during a lecture without the teacher's intervention. This system guarantees a reliable way of marking attendance. The problem with this approach is that it can be time consuming and unsanitary because of direct touch to the device.

D. Face Recognition based attendance system

A high-definition camera detects individual faces using biometric detection technology. The recorded faces are compared to known faces stored in the database. If the code of the face is matched to a saved image, it is marked present. In this system, there are possibilities for the camera to not capture the image properly or it may miss some of the students from capturing. In the past, algorithms like Viola-Jones Algorithm, Eigenface, Fisherface, Local Binary Patterns Histograms (LBPH) etc. have been implemented to get accurate results.

III. METHODOLOGY

A. Primary database collection

Dataset of the students is created before the recognition process. All the students of the class are required to register with their name and image in a file which is the dataset. The images are then resized and converted from BGR to RGB format as the face recognition library loads images in the form ofBGR and in order to print the image you should convert it into RGB using OpenCV.

B. Face detection

We need to locate the face from the live streaming video. The algorithm used here is the Haar-Cascade algorithm. It performs feature extraction using edge or line detection features. Individual faces and their distinct features are obtained (lips, eyes, nose & ears). At last, we need to draw a rectangular bounding box to showcase the detected face.

Fig.2 Face detection on trained image

C. Face encoding

We need to extract a few basic measurements from each face. We reduce complex raw data like an image to a list of computer-generated numbers. Then we could measure our unknown face and find a known face with the closest measurements. For example, we can measure the size of each ear, the distance between the eyes, the length of the nose, etc. We will train this to generate 128 measurements for each face. So, what parts of the face exactly do these 128 numbers measure? It turns out we have no idea. We don't really care. We only care that the network generates nearly identical numbers when looking at two different images of the same person

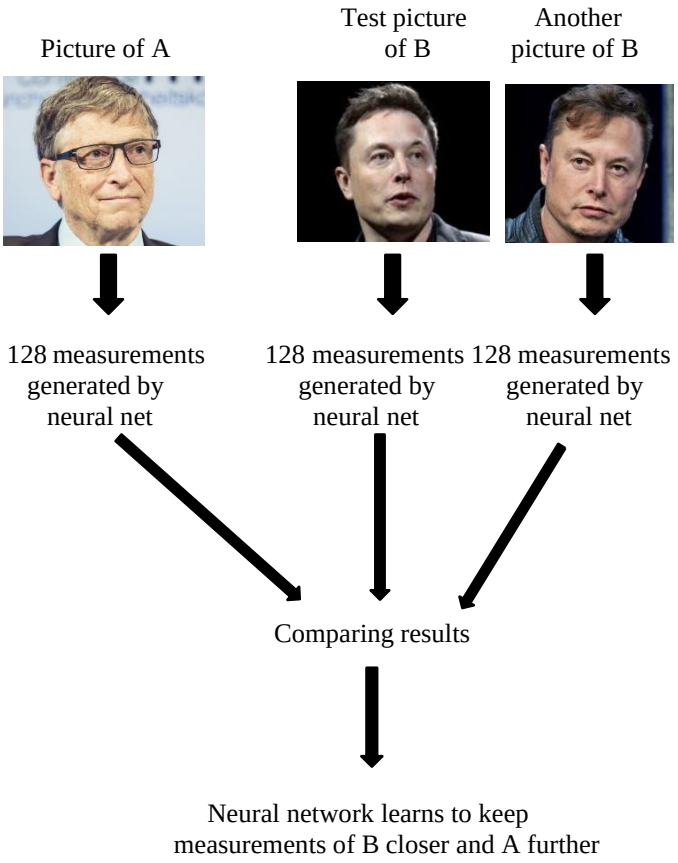


Fig.3 Encoding process

D. Face matching/comparison

After face encoding, we compare the 128 measurements of the test image with the database of trained images (each having 128 measurements) to find out who has the closest measurements to our test image. We'll use a simple linear SVM classifier at the backend to find the match. For e.g., if we comparethe test image of Elon musk with his trained image, it will return true if it's a match and false if it's not. Then we find the distance of test image with the trained image. Lower the distance (b/w 0 and 1), more the similarity.

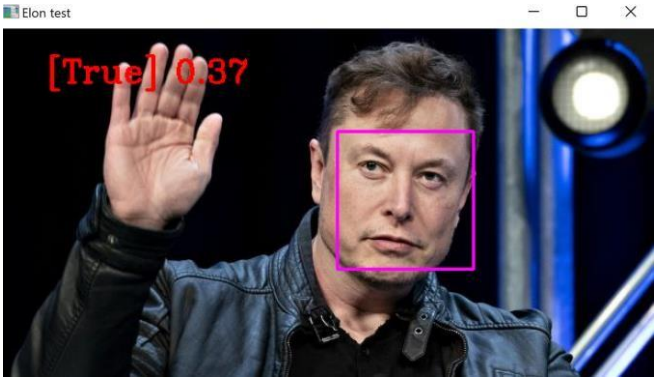


Fig.4 Test image 1 compared with trained image of Elon Musk

Fig.5 Test image 2 compared with trained image of Elon Musk

E. Attendance updating

After the testing and training process, we implement the model for attendance project. The live streaming web cam recognizes the faces from the images stored in the database.

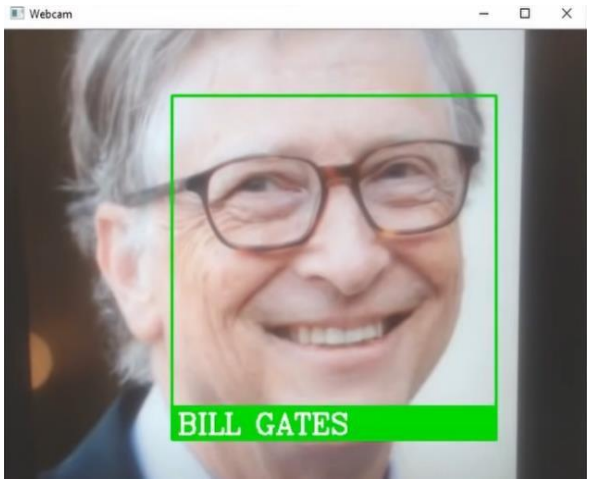
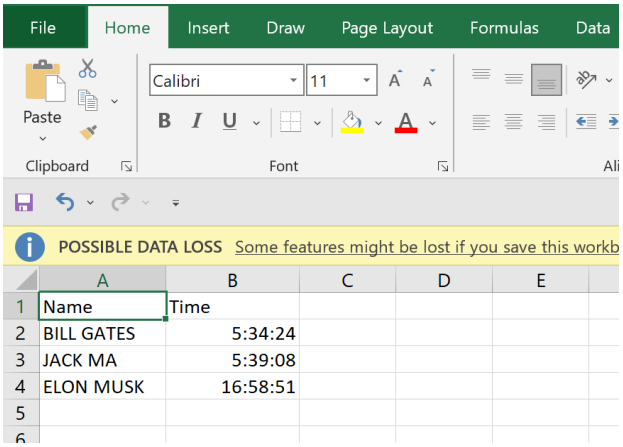


Fig.6 Recognized face

After the face is recognized, the program creates an entry in the .csv file and exports the name of the respective student and also marks the time at which the face was detected and. The system does not allow overwriting of the same entry.



	A	B	C	D	E
1	Name	Time			
2	BILL GATES	5:34:24			
3	JACK MA	5:39:08			
4	ELON MUSK	16:58:51			
5					

Fig.7 Attendance sheet

The whole process can be summed up through the following block diagrams:

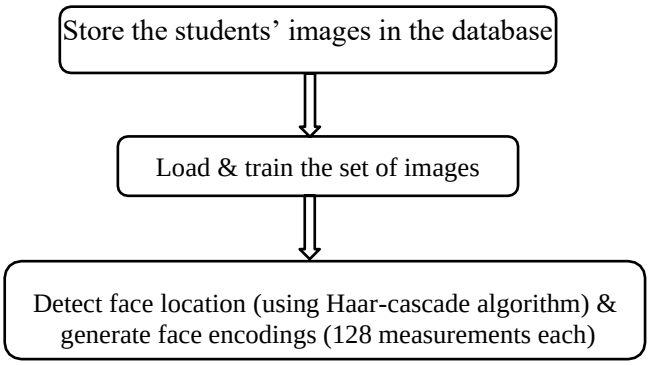


Fig.8 Pre-processing

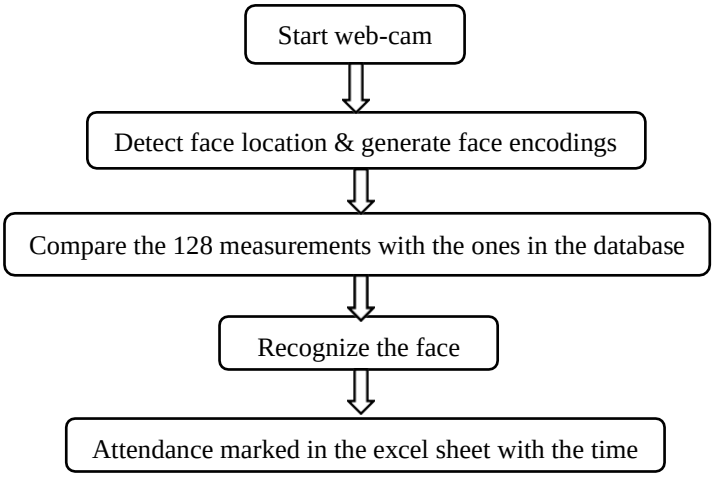


Fig.9 Attendance generation

IV. Conclusion

The face recognition-based Attendance system is easy to use and works efficiently. The system works automatically once the registration of individual student and needs less to no human input while being foolproof. The Automated Classroom Attendance System helps in increasing the accuracy, saving time and increase the overall efficiency of the class.

V. Further enhancements

For better functionality and reliability of the system, we can add and enhance the following features:

1. Recognize at least 5 faces at a time to help save time of the class.
2. The system may not function properly in poor lighting conditions. This can be overcome by improving the video quality and implementing certain algorithms.
3. Algorithms can be implemented to recognize the student from certain angles and distance.

VI. References

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