Student Attendance Using Face Recognition

Mahalakshmi A[1], Srikoushikkamal S[2]

[1]Professor, Dept. of Computer Science and Engineering, Sri Shakthi Institute of Engineering and Technology, Coimbatore, India
[2]B.E Student, Computer Science and Engineering, Sri Shakthi Institute of Engineering and Technology, Coimbatore, India

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Abstract - *In this autonomous growing world, verification of one's arrival is meant as attendance. This practice of marking attendance has been gradually changing its state. Ultimately, from manual marking to smart attendance there has been a large change throughout this development. Specifically attendance in a school or college, is very much high in priority as well as tiring process. These conventional methods of student attendance could take a lot of time in processing and dealing with every individual. So, this could naturally become a time consuming process. So, a different approach was required to consume the class hours and make it even more efficient for the teacher as well as the students. This path of smart attendance is acquired by machine learning. This project stands to be an web application that requests for a group picture, where face detection happens along with face recognition of the individual faces using LBPH algorithm and Haar-Cascade classifier, and marks the attendance in google sheets as an attendance database, with respect to the day and class hours.*

Key Words: Smart Attendance, Web Application, Face Detection, Haar-Cascade Classifier, LBPH Algorithm.

1. INTRODUCTION

Attendance can be in any form of approval, for instance it can be manually verified by an individual, or standalone camera to recognize faces, biometric scanners and many more. So, usually in schools and colleges the crowd that is taken in count is always huge and becomes an immense process to the management to create a common database along with many register books and a lot of handwritten data to ensure the clear track of attendance. All put together, attendance becomes tiring at times. To reduce the effort and time taken to mark attendance, this project helps marking attendance using face recognition that is later stored in google sheets as a form of record. The main purpose to build this web application was to avoid having a standalone camera for every class that could cost a lot of money and management. Whereas, in our system, smartphones are being used as target devices. This web app requests for a single group picture that uses image processing and face recognition to mark attendance. It also has a class login for individual classes to have a convenient track of attendance.

1.1 Face Detection and Recognition

Face detection and recognition applications help to figure out if the face found in the camera matches with the database that is prepared. This process is very efficient and valuable while using a sufficient amount of data. These applications are spread all around the world with different requirements, and the recognition can be even faster when the algorithm is powerful. Using the exact parameters, functions & data will make the application user friendly.

1.2 Attendance

CCTV is also used as a face recognition camera in many regions. School and college are other places to use a camera that only works on face recognition where the process can be live detection as the face gets recognized in real-time. Python language supports a lot of face recognition models that help building a strong machine learning algorithm marking attendance of students using a single group picture. The picture undergoes the ml algorithm that compares a database and marks attendance according to the particular professor with time and date.

2. Related Works

Authors in [3] proposed a model of an automated attendance system. The model focuses on how face recognition incorporated with Radio Frequency Identification (RFID) detects the authorized students and counts as they get in and get out from the classroom. The system keeps the authentic record of every registered student. The system also keeps the data of every student registered for a particular course in the attendance log and provides necessary information according to the need.In this paper [4], authors have designed and implemented an attendance system which uses iris biometrics. Initially, the attendees were asked to register their details along with their unique iris template. At the time of attendance, the system automatically took class attendance by capturing the eye image of each attendee, recognizing their iris, and searching for a match in the created database. The prototype was web based.

In [5], authors proposed an attendance system based on facial recognition. The algorithms like Viola-Jones and histogram of Oriented Gradients (HOG) features along with Support Vector Machine (SVM) classifier were used

to implement the system. Various real time scenarios such as scaling, illumination, occlusions and pose were considered by the authors. Quantitative analysis was done on the basis of Peak Signal to Noise Ratio (PSNR) values and was implemented in MATLAB GUI.

Authors in [6] researched to get the best facial recognition algorithm (Eigenface and Fisherface provided by the OpenCV 2.4.8 by comparing the Receiver Operating Characteristics (ROC) curve and then implementing it in the attendance system. Based on the experiments carried out in this paper, the ROC curve proved that Eigenface achieves better results than Fisherface. Systems implemented using the Eigenface algorithm achieved an accuracy rate of 70% to 90%.

In [7], authors proposed a method for the student attendance system in the classroom using face recognition techniques by combining Discrete Wavelet Transforms (DWT) and Discrete Cosine Transform (DCT). These algorithms were used to extract the features of the student's face followed by applying Radial Basis Function (RBF) for classifying the facial objects. This system achieved an accuracy rate of 82%.

3. METHODOLOGY

The previous systems that had real time recognition are not required over here. Initially all the student's faces are taken into a database, later then in the web application the attendance procedure starts with just giving one single group picture as an input to the algorithm. That is all that is required to mark attendance that takes less than 30 seconds. The algorithm detects the faces all together and then the face recognition module helps to compare the detected faces with the database given. Now, when the faces are matched to the database the concerned student's name is marked "Present" in the google sheets. Finally, the remaining names are to be entered as "Absent".

The dataset required here is the student's face whereas it is collected through the web application and also can be a manual addition to the database. Here Google Drive is used as a database. A minimum of one picture per student is mandatory to create a database. More the pictures of a student, the more accuracy it acquires. In the database the pictures are saved according to their names, this helps in fetching the names during the face recognition. Also, multiple pictures are accepted in the algorithm and the maximum accurate picture regarding the LBPH algorithm is chosen to be the face recognized.
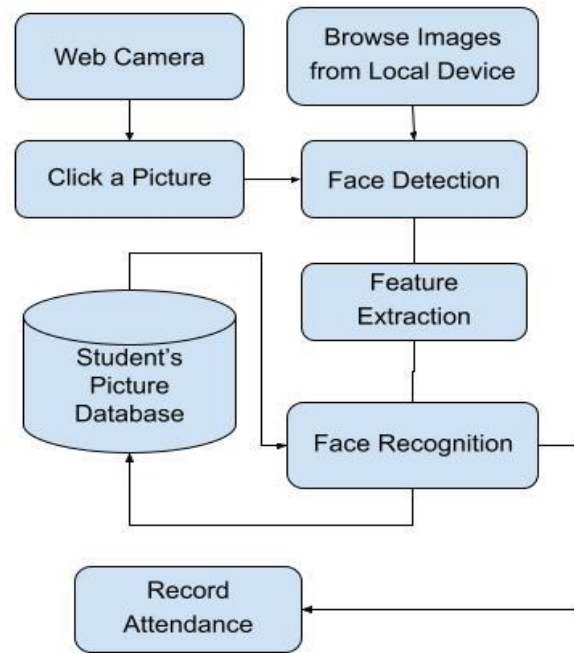
Feature extraction is a process to retrieve the potential features of a target face, and Haar-Cascade classifier is used to handle this job. This classifier is an inbuilt module in python that helps in detecting human faces using a xml file-haarcascade_frontalface_default. Now a prediction bounding box is set to the detected faces, which can be done by the detectMultiScale module from python which has to surpass conditions and preferences like scaleFactor, minNeighbors, minSize. This completes the face detection process.

Here, the detected faces are taken in count and looped in a way that it can execute every face that is detected. In this process the face recognition module is used to compare between the faces from the input and the database. As the face recognition module works on LBPH algorithm (Linear Binary Pattern Histogram), it converts the input faces into decimals. Now the dataset images are also converted to histograms as decimal values. During this process both the input data and training data are compared between them to find the most possible accurate data that when assures a highest probability ranked face is taken as a result along with the name given to it in the image file as a byproduct to mark attendance.

Here Google Sheets are used for the attendance updation and tracking. While the faces have been recognized, the relative label name of the student given in the train data is used to update the attendance in the google sheets representing "Present" or "Absent". Total attendance is also calculated as per everyday basis of a particular subject.

	A	B	C
1	Chemistry	12/2/2022	
2			
3	Student Names	Attendancee	Total attendance in current subject
4	Srinivasan	Present	84%
5	Yashwanth	Present	90%
6	U_Vignesh	Present	79%
7	K_Vignesh	Present	86%
8	Koushik	Present	56%
9	Sarvajith	Absent	78%
10	Santosh	Absent	67%
11	Ramesh	Absent	97%

4. Conclusions

In a complete format, the student can sign up, login to help them upload their pictures and personal details and verify them to the database. The professors can also login themselves as a user to take attendance exclusively whereas a student login is not allowed to mark or edit the attendance. This web application uses both clicking pictures and browsing the pictures taken previously through the local machine's storage.

Here, the student database is prepared well enough for the attendance. So, the student at least uploads 3 to 4 pictures of himself/herself to keep the parameters that shouldn't be missed in any level of brightness, angle, correctness, clarity taken from a picture during the attendance, this assures the student is marked exactly as applied. Any false pattern match if happens and the attendance gets uploaded to the sheets, only the concerned staff is able to edit the sheet.

While clicking the picture, it is important to make sure the room has enough brightness and the camera frame covers the students altogether. If cannot cover the frame for the entire students in the class. Then, the user can upload the picture of 15 students each in one frame to attain a good clarity of faces that makes error free recognition and continue to upload the series of pictures and the sheets fills in the sequence given. The motive of this application is to click a single group picture of all students, so the above step is followed when the user's device doesn't have a good camera application level quality.

In this web application, the staff/professor needs to sign up and login and assign the subject they handle along with mail id and phone number. This allows them to move forward and select the class they are supposed to attend. Now the student database is automatically synced to the particular staff's account. So, the picture given in the input checks the faces related to the database synced.

Finally, the faces found are marked as "Present" and the rest of students, if the faces could not be matched with the database, are marked as "Absent". This sheet can get updated any required times in a day and everyday a new sheet is assigned and this can be viewed by the staff community as well as the students in the respective class through the application.

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BIOGRAPHIES

Prof Mahalakshmi belongs to the department of Computer Science and Engineering from Sri Shakthi Institute of Engineering and Technology from Coimbatore, Tamilnadu, India.

Srikoushikkamal S is a Computer Science and Engineering Student from Sri Shakthi Institute of Engineering and Technology Coimbatore, Tamilnadu, India. His primary research interests are in machine learning and data science.