AUTOMATED ATTENDANCE BY IMAGE PROCESSING USING IOT

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Abstract—Nowadays, machine learning algorithms in the field of image processing have become an important part for the purpose of security and surveillance. Here image processing technique used as a main source to identify the object, then it will update information about the object on database. System software will analysis those data, then compute the attendance, percentage, etc.., and then generates the hall ticket for student or salary for employee.

Here based on Students Uniqueness or individuality of an individual is his face. In this project face of an individual is used for the purpose of attendance making automatically. Attendance of the student is very important for every college, universities and school. Conventional methodology for taking attendance is by calling the name or roll number of the student and the attendance is recorded. Time consumption for this purpose is an important point of concern. Assume that the duration for one subject is around 60 minutes or 1 hour & to record attendance takes 5 to 10 minutes. For every tutor this is consumption of time. To stay away from these losses, an automatic process is used in this project which is based on image processing.

In this project, face detection and face recognition is used. Face detection is used to locate the position of face region and face recognition is used for marking the understudy's attendance. The database of all the students in the class is stored and when the face of the individual student matches with one of the faces stored in the database then the attendance is recorded. This method is tedious, time consuming and inaccurate as some students often sign for their absent colleagues. In this project, the design and use of a face detection and recognition system to automatically detect students attending a lecture in a classroom and mark their attendance by recognizing their faces.

Keywords— Machine learning, Image processing, Open CV, convolutional neural network, Haar casecade, Sqlite3, Tkinter/python.

I. INTRODUCTION TO AUTOMATIC CLASS ATTENDANCE

Maintaining attendance is very important in all learning institutes for checking the performance of students. In most learning institutions, student attendances are manually taken by the use of attendance sheets issued by the department heads as part of regulation. The students sign in these sheets which are then filled or manually logged in to a computer for future analysis. This method is tedious, time consuming and inaccurate as some students often sign for their absent colleagues. This method also makes it difficult to track the attendance of individual students in a large classroom environment. In this project, we propose the design and use of a face detection and recognition system to automatically detect students attending a lecture in a classroom and mark their attendance by recognizing their faces.

While other biometric methods of identification (such as iris scans or fingerprints) can be more accurate, students usually have to queue for long at the time they enter the class room. Face recognition is chosen owing to its non-intrusive nature and familiarity as people primarily recognize the other people based on their facial features. This (facial) biometric system will be consist of an enrollment process in which the unique features of a persons' face will be stored in a database and then the processes of identification and verification. In these, the detected face in an image (obtained from the camera) will be compared with the previously stored faces captured at the time of enrolment.

II. MOTIVATION

The main motivation for us to go for this project was the slow and inefficient traditional manual attendance system. This made us to think why not make it automated fast and mush efficient. Also

such face detection techniques are in use by department like crime investigation where they use cc TV footages and detect the faces from the crime scene and compare those with criminal database to recognize them. Also face book, it uses an algorithm called deep face whose accuracy to recognize is 97.25% which is as close as what humans have that is 97.53%.

III.   PROBLEM DEFINITION

The traditional manual methods of monitoring student attendance in lectures are tedious as the signed attendance sheets have to be manually logged in to a computer system for analysis. This is tedious, time consuming and prone to inaccuracies as some students in the department often sign for their absent colleagues, rendering this method ineffective in tracking the students class attendance.

IV.   CURRENT SYSTEMS

At present attendance marking involves manual attendance on paper sheet by professors and teachers. But it is very time consuming process and chances of proxy is also one problem that arises in such type of attendance marking. Also there are attendance marking system such as RFID , Biometrics etc. But these systems are currently not so much popular in schools and classrooms for students as they have their own advantages and disadvantages.

V.   THE PROBLEMS WITH CURRENT SYSTEM

The problem with this approach in which manually taking and maintains the attendance records is that it is very inconvenient task. Traditionally student attendances are taken manually by using attendance sheet given by the faculty members in class, which is a time consuming event. Moreover, it is very difficult to verify one by one student in a large classroom environment with distributed branches whether the authenticated students are actually responding or not. The ability to compute the attendance percentage becomes a major task as manual computation produces errors, and also wastes a lot of time. This method could easily allow for impersonation and the attendance sheet could be stolen or lost.

VI.   ADVANTAGES OVER CURRENT SYSTEM

The previous approach in which manually takes and maintains the attendance records was very inconvenient task. Traditionally, student attendances are taken manually by using attendance sheet given the faculty members in class, which is a time consuming event. Moreover, it is very difficult to verify one by one student in a large classroom environment with distributed branches whether the authenticated students are actually responding or not. The ability to compute the attendance percentage becomes a major task as manual computation produces errors, and also wastes a lot of time. This method could easily allow for impersonation and the attendance sheet could be stolen or lost.

An automatic attendance management system using biometrics would provide needed solution. The results showed improved performance over manual attendance management system. Biometric-based techniques have emerged as the most promising option for recognizing individuals in recent years since, instead of authenticating people and granting them access to physical and virtual domains based on passwords, PINs, smart cards, plastic cards, tokens, keys and so forth, these methods examine an individual physiological and/or behavioral characteristics in order to determine and/or ascertain his identity.

Biometric based technologies include identification based on physiological characteristics (such as face, fingerprints, finger geometry, hand geometry, hand veins, palm, iris, retina, ear and voice) and behavioral traits (such as gait, signature and keystroke dynamics). Face recognition appears to offer several advantages over other biometric methods, a few of which are outlined here Almost all these technologies require some voluntary action by the user, i.e., the user needs to place his hand on a hand-rest for fingerprinting or hand geometry detection and has to stand in a fixed position in front of a camera for iris or retina identification.

VII.   GOALS AND OBJECTIVES

The overall objective is to develop an automated class attendance management system comprising of a desktop application working in conjunction with a mobile application to perform the following tasks:

- To detect faces in real time.
- To recognize the detected faces by the use of a suitable algorithm.
- To update the class attendance register after a successful match.

VIII. SCOPE AND APPLICATIONS

This project performs well in the area of face detection and recognition but there is a room to improve the algorithm performance in case of large number of students and also in case of faces captured in a dark environment proposed system can be extended in the future to cover this aspect. The efficiency of the algorithm also can be increased further so there is also a room for future work in this area. The proposed system can be enhanced further in terms of achieving more efficiency by ease of analysis of patterns in the data.

IX. JUSTIFICATION

This project serves to automate the prevalent traditional tedious and time wasting methods of marking student attendance in classrooms. The use of automatic attendance through face detection and recognition will increase the effectiveness of attendance monitoring and management. This method could also be extended for use in examination halls to curb cases of impersonation as the system will be able to single out the imposters who won't have been captured during the enrollment process. Applications of face recognition are widely used spreading in areas such as criminal identification, security systems, image and film processing. The system could also find.

X. FACIAL RECOGNITION BASED ATTENDANCE SYSTEM

A. DESCRIPTION

Today in most colleges and universities attendance is done manually or by biometric means which takes a considerable amount of time or require a large number of resources. The pen and paper based attendance system requires a large amount of human effort and hence resulting in manual errors. Whereas the biometric system requires a large amount of capital cost and the considerable amount of operational cost. We propose a fully software based approach using facial recognition base authentication methods to reduce the nuisance of pen and paper based attendance system, proxies, and the high maintenance cost of the biometrics.

1) PROS
- The system is portable and can be easily installed and used on any mobile phone running Android OS.
- The authentication model proposed in the system eliminates the nuisance of proxies completely by following a pure software approach, which reduces the cost involved with system considerably.
- The complete process of attendance registration takes place in just a few seconds.

2) CONS
- Too much authentication and verification steps are involved, herby only technical people can easily use the software.

3) HOW WE OVERCOME THOSE PROBLEM IN PROJECT

Using just the appropriate face detection and recognition algorithms, all the authentication steps can be eliminated.

I. STUDENT ATTENDANCE TRACKER SYSTEM

A. DESCRIPTION

In many colleges teachers use to take attendance manually. Main objective of this project is to add mobility and automation in the existing attendance process. This system helps teachers to take attendance through mobile and also keep in touch with student in some aspect.

This System allow teachers to take attendance, edit attendance, view student's bunks, send important documents in PDF format such as exam time table, question bank etc. and also helps teachers to inform students about the events that college is going to organize. This system also helps students in specifying bunks, deleting bunks, viewing their bunks. This system gives a prior intimation to student as soon as his attendance goes below the specified attendance deadline in the form of an alert. This system helps students to keep in touch with the events that college is going to organize.

1) PROS
- Installing this software into the android smart phone Calculating the attendance, it will too time consuming for the staff.
- Improve the accuracy.
- No chance of the mistake while calculating the attendance manually.

2) CONS
- Android Phone is the major requirement for this software to work .
- The system consists of how effectively the student can bunk the lectures, which is demoralizing the student to attend all the lectures.

XI. HOW WE OVERCOME THOSE PROBLEM IN PROJECT

The platform (OS) on which the system is working should be changed so as to maintain the costing of using the system, on user end.

The system should motivate students to attend all the lectures rather than including modules such as bunk manager, which indirectly demotivates them to attend all the lectures.

XII. TECHNOLOGICAL REVIEW:

A. SQLite Server :

Microsoft SQLite server is a relational database management system developed by Microsoft. As a database server, it is a software product with the primary function of storing and retrieving data as requested by other software applications which may run either on the same computer or another computer across a network (including the Internet).

Microsoft markets at least a dozen different editions of Microsoft SQLite Server, aimed at different audiences and for workloads ranging from small single machine applications to large Internet facing applications with many concurrent users.

The history of Microsoft SQLite server begins with the first Microsoft SQLite server product SQLite server 1.0, a 16-bit server for the OS/2 operating system in 1989 and extends to the current day.

As of December 2016 the following versions are supported by Microsoft:

- SQLite Server 2008
- SQLite Server 2008 R2
- SQLite Server 2012
- SQLite Server 2014
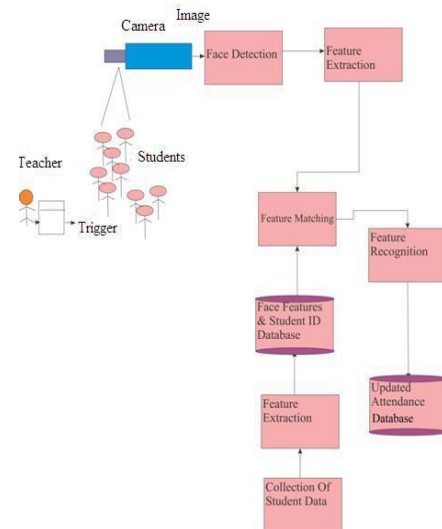- SQLite Server 2016

XIII. SYSTEM ARCHITECTURE

Figure 1: System Architecture

In this proposed system, the system is instantiated by the mobile .After triggers then the system starts processing the image for which we want to mark the attendance. Image Capturing phase is one in which we capture the image. This is basic phase from which we start initializing our system. We capture an image from a camera which is predominantly checked for certain constraints like lightning, spacing, density, facial expressions. The captured image for is resolute for our requirements. Once it is resolute we make sure it is either in png or jpeg format else it is converted. We take individuals and different frontal postures so that the accuracy can be attained to the maximum extent. This is the training database in which every individual has been classified based on labels. For the captured image, from an every object we detect only frontal faces from detects only the frontal face posture of an every individual from the captured image. This detects only faces and removes every other parts since we are exploring the features of only faces. These detected faces are stored in the test database for further enquiry. Features are extracted in this extraction phase. The detected bounding boxes are further queried to look for features extraction and the extracted features are stored in matrix. For every detected phase this feature extraction is done. Features we look here are Shape, Edge, Color, Wavelet, Auto- Face is recognized once we completed extracting features.
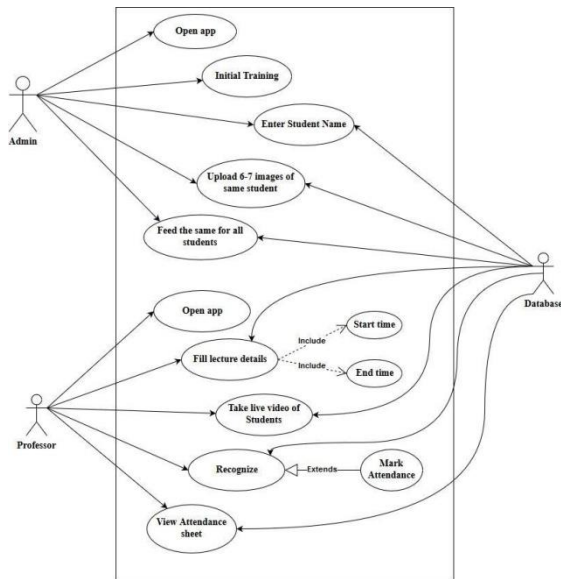
Figure 2: Use case Diagram

The use case of face recognition below explain the authorities of Exist user and new user , that new user the only function can do it to sign up to create new account and add it to the list as a photo , in the other hand the exit user can do many functions that allow him to log in to the system ,take photo by computes camera or enter a facial picture , then the system will make comparison between the stored photo and the photo that entered by exist user it in the system .

XV.   DATA FLOW DIAGRAM
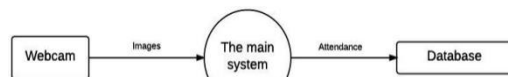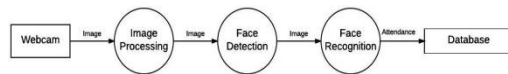

Figure 3: DFD Level 0

Figure 4: DFD Level 1

1) DFD LEVEL 0
   - Webcam
   - Main System
   - Database
2) DFD LEVEL 1
   - Webcam
   - Image Processing
   - Face Detection
   - Face Recognition
   - Database
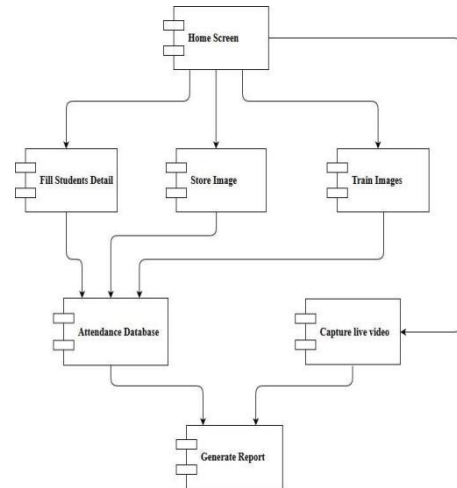
A.   COMPONENT DIAGRAM

Figure 5: Component Diagram

The exist user will make sign in because already has an account, he will take a photo by interface which has a computer's camera that enable the user to take a picture " if the camera not work the user can enter any facial picture in some constraints" then the photo will be sent to the facial recognition system and it is task to matching the photo inside facial recognition system object this enable the system to make comparison between the entered photo and the stored one in the data base.
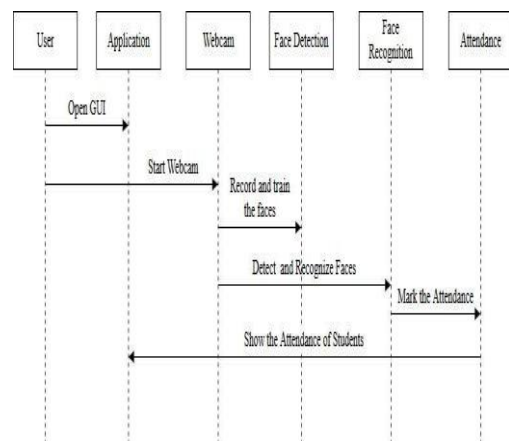
B.   SEQUENCE DIAGRAM

Figure 6: Sequence diagram

The new user will make new registration as a sign up by interface, the registration requirements will send to the desktop that will send it to the facial system and store it in the data base. Now new account will add to the list in the data base.
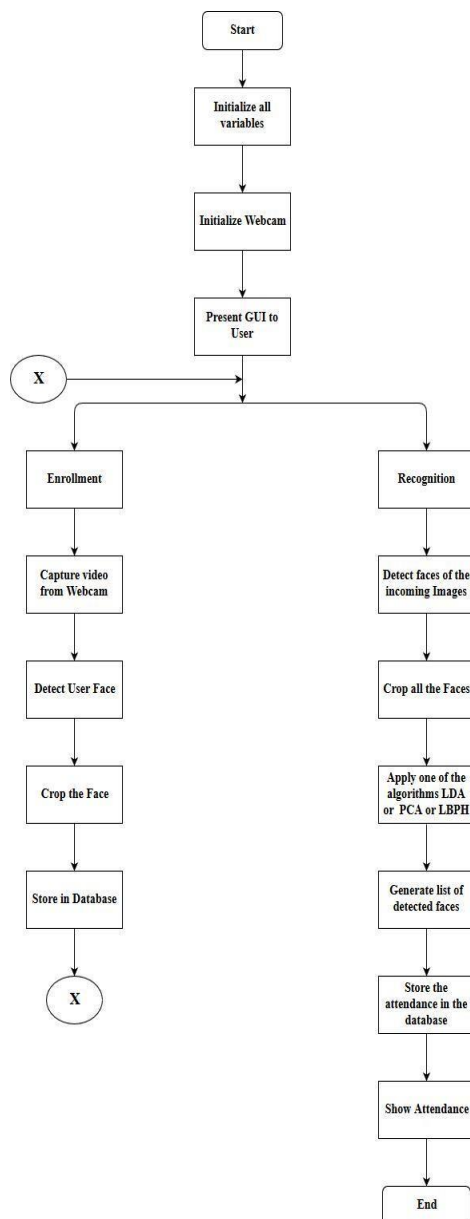
C. Flow Chart

Figure 7: Flow Chart

D. REAL TIME FACE RECOGNITION.

Figure 8: Real time face recognition.

The recognition algorithm simply checks the training.xml file for any known class, if matched then entry is logged. The output is also shown in the video feed from the webcam upon the person's face with a square on the face and also simultaneously it is updated to the sqlite database and also in cvs file.

E. FACE RECOGNITION

Lastly, face recognition feature which makes this system more secure and safe; even if someone forgets to entry their RFID card or finger print camera is always recording who is coming in and getting out. The camera present in the premise will record every moment and detect faces and register the data in the system. A python based real time facial recognition system was developed and used to detect the entry of a person. It is one of the most secure methods to log an entry since it can only be copied if there are twins. The method itself comprised of two main aspects: training and recognition. A webcam was used to take the input of faces in real time and the training and recognition algorithms were running in Python 3 using Virtual Environment. The python packages that were used are:

- opencv
- numpy
- virtualenv

The method used for training the system was using haar based cascade classifiers. This includes the process of saving the images into numeric vectors. Later, these values will be used to identify the faces. First, the application reads the two destinations, the one for negative images, and the one for positive images. Both the destinations will be read throughout the training process, and final values will be exported to an XML file called training.xml. During this process the application reads grayscale images, which are later formatted to be used for face recognition. After they are formatted, vectors are set based on X and Y coordinates. After that process, the application continues to save the images in numeric values, and in the end, it will send a message telling that the savings have been successful. All images will be saved in three models, medium, positive, and negative.
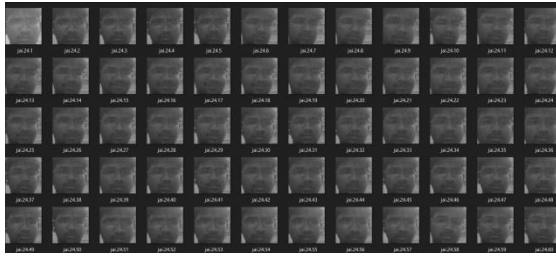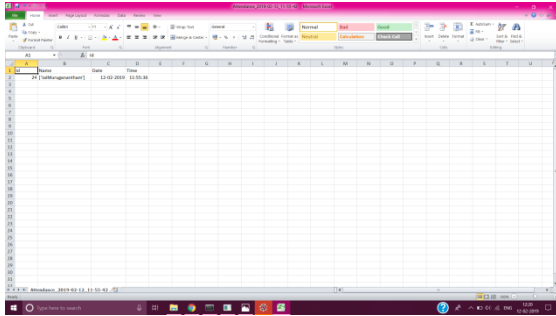
Figure 9: Training data set

Figure 13: Facial Recognition CSV Sheet

Figure 13 shows the entry log of different users via the face recognition technique. When the python scripts read a known face, the time data stamps of that user is recorded in a CSV sheet

XVI.   RASPBERRY PI

The Raspberry pi is a low cost, credit -card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse.

Figure 14:Raspberry PI

Camera connect with Respbery PI through internet.

XVII.   FUTURE WORK

There are still a lot of ways this system can be developed more for a better safety and security system. Things that can be of future addition to the system are adding a proper warning system with continuous surveillance. Deep learning can be integrated for facial recognition, trained on a larger dataset. Also, making the device more compact by adding a mobile application for dynamic entry of a new user.

The research work has implemented a face recognition system by using some technique. Often, its operation can be thought of as revealing the internal structure of the data in a way which best explains the variance in the data. By implementing the proposed Face Recognition System supplies the user with a lower-dimensional picture, a "shadow" of this object when viewed from its most informative viewpoint.

The algorithm has been tested with multiple students in the scene and also captured faces at different angles in the scene. The algorithm delivers quite good results but there is a room to improve the algorithm performance in case of large number of students and also in case of faces captured in a dark environment, so proposed system can be extended in the future to cover this aspect. The efficiency of the algorithm also can be increased further so there is also a room for future work in this area. This system can be enhanced further in terms of achieving more efficiency by ease of analysis of patterns in the data.

XVIII.   CONCLUSION

Recent security crises demands for a proper security system, this system acts not only as an attendance system but also a surveillance system. With use of Automated attendance system attendance will be more smarter than actual process. It also send the message to the particular student/employee it contains information about attendance details. It will generate the hall ticket for students and salary for employees, it based on requirements.

XIX.   ACKNOWLEDGEMENT

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XX.   REFERENCES.

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