

A Framework Design for Attendance Management Using Face Recognition

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ABSTRACT

The main purpose of this project is to build a face recognition-based attendance monitoring system for educational institution to enhance and upgrade the current attendance system into more efficient and effective as compared to before. The current old system has a lot of ambiguity that caused inaccurate and inefficient of attendance taking. Many problems arise when the authority is unable to enforce the regulation that exist in the old system. Thus, by means of technology, this project will resolve the flaws existed in the current system while bringing attendance taking to a whole new level by automating most of the tasks.

The technology working behind will be the face recognition system. The human face is one of the natural traits that can uniquely identify an individual. Therefore, it is used to trace identity as the possibilities for a face to deviate or being duplicated is low. In this project, face databases will be created to pump data into the recognizer algorithm. Then, during the attendance taking session, faces will be compared against the database to seek for identity. When an individual is identified, its attendance will be taken down automatically saving necessary information into a database system. At the end of the day, the attendance information regarding an individual can be accessed from a web server hosted by the raspberry pi. In short, this upgraded version of attendance monitoring system not only saved many resources, but also provides huge convenience to the authority as many processes are automated.

Keywords: attendance, session, databases, identity, raspberry pi, monitoring.

1. INTRODUCTION

The project is developed based on the IoT (Internet of Things) concept where smart device is used to manage systems. IoT is generally about numerous devices being interconnected uniquely in the existing internet infrastructure where information are shared among them. It can be viewed as a nervous system that links anything or everything together. It is usually achieved using sophisticated sensors and chips which are embedded in the physical things for real-time information retrieval. Data collected will then be analysed where intelligent decision will be taken by machines without human intervention to either solve the existing problem or to improve the current situation. In short, the IoT technology enhances many existing system to be more efficient and smarter[1]. The application area of this project is involved in the smart cities sub - field. Smart cities are a development vision using Information & Communication technology (ICT) in urban advancement where city's assets will be managed by smart devices to improve efficiency and also to reduce human resource consumption. By integrating these concepts, a Smart attendance monitoring system will be developed.

1.1 Problem Statement

According to the previous attendance management system, the accuracy of the data collected is the biggest issue. This is because

- The attendance might not be recorded personally by the original person, in another word, the attendance of a particular person can be taken by a third party without the realization of the

institution which violates the accuracy of the data. For example, student A is lazy to attend a particular class, so student B helped him/her to sign for the attendance which in fact student A didn't attend the class, but the system overlooked this matter due to no enforcement practiced.

- Supposing the institution establish an enforcement, it might need to waste a lot of human resource and time which in turn will not be practical at all. Thus, all the recorded attendance in the previous system is not reliable for analysis usage. The second problem of the previous system is where it is too time consuming[2].
- Assuming the time taken for a student to sign his/her attendance on a 3-4 paged name list is approximately 1 minute. In 1 hour, only approximately 60 students can sign their attendance which is obviously inefficient and time consuming.
- The third issue is with the accessibility of those information by the legitimate concerned party. For an example, most of the parents are very concerned to track their child's actual whereabouts to ensure their kid really attend the classes in college/school[9].
- However in the previous system, there are no ways for the parents to access such information. Therefore, [10]evolution is needed to be done to the previous system to improve efficiency, data accuracy and provides accessibility to the information for that legitimate party.

1.2 Objectives

- To ensure and to develop a portable Smart Attendance System which is handy and self-powered.
- The speed of the attendance recording process is faster than the previous system which can go as fast as approximately 3 second for each student.
- Have sufficient memory space to store the database.
- Able to recognize the face of an individual accurately based on the face database.
- Allow parents to track their child's attendance.
- Develop a database for the attendance management system.
- Provide a user friendly web interface for admins to access the attendance database and for non-admins (parents) to check their child's attendance.
- Allow new students or staff to store their faces in the database by using a GUI.
- Able to show an indication to the user whether the face recognition process is successful or not.

2. LITERATURE SURVEY

According to research journal "Attendance System Using NFC Technology with Embedded Camera on Mobile Device" (Bhise, Khichi, Korde, Lokare, 2015)[3]. The attendance system is improved by using Near Field Communication (NFC) technology and mobile application. According to the research paper, each student is given a NFC tag that has a unique ID during their enrolment into the college[11]. Attendance of each class will then be taken by touching or moving these tags on the lecturer mobile phone. The embedded camera on the phone will then capture the student's face to send all the data to the college server to do validation and verification. The advantages of this method are where the NFC is simple to use, and the speed of connection establishment is very high. It indeed speeds up the attendance taking process a lot. However, this system couldn't automatically spot the violation when the NFC tag is not personally tagged by the original owner. Apart from that, the convenience of the system which uses the mobile phone as the NFC reader was actually an inconvenience to the lecturer[8]. Imagine if the lecturer had forgotten to bring their mobile phones to work, what would be the backup procedure for the attendance to be recorded? [4]Moreover, most of the lecturer will not likely to prefer their personal smart phones to be used in this way due to privacy matter. Hence, unique information about the student likes biometrics or face- recognition, which is genuine for a student should be used in replacement of the NFC tag. This will ensure attendance to be taken originally by the actual student. The second research journals "Face Recognition Based Attendance Marking System" (Senthamil Selvi, Chitrakala, Antony Jenitha, 2014) is based on the identification of face- recognition to solve

the previous attendance system's issues. This system uses camera to capture the images of the employee to do face detection and recognition. The captured this system is where attendance is marked on the server which is highly secure where no one can mark the attendance of other. Moreover, in this proposed system, the face detection algorithm is improved by using the skin classification technique to increase the accuracy of the detection process. Although more efforts are invested in the accuracy of the face detection algorithm, the system is yet not portable. This system requires a standalone computer which will need a constant power supply that makes it not portable[7]. This type of system is only suitable for marking staff's attendance as they only need to report their presence once a day, unlike students which require to report their attendance at every class on a particular day, it will be inconvenient if the attendance marking system is not portable. Thus, to solve this issue, the whole attendance management system can be developed on an embedded design so that it can be work similarly with just batteries that makes it portable.

3. SYSTEM DEVELOPMENT

The hardware used in this project so far consists of only 4 components which are:

- Raspberry Pi 3
- Raspberry Pi 8mp Camera Module
- Power Supply Cable
- 16Gb Micro SD Card Class 10



Fig. 1 Connections of pi-fan and pi-camera onto the raspberry pi 3 board with Final assembled product

3.1 Dataset

Here, the sample images of the faces used in this project are the faces downloaded from the internet. This is due the insufficient reluctance of real person to join the testing community. Thus, this problem is solved by using the downloaded faces to form the face database while adding some of the real images captured from the system's pi camera to prepare the database for verification test[5]. The specific face database being used is named AT&T Face database which can be obtained from <http://www.cl.cam.ac.uk/research/dtg/attarchive/facedatabase.html>. In the provided database, there are 40 different subjects each with 10 sets of their very own portrait captured at a different timeline. This database consists of subjects with different expressions such as a smiling or frowning and etc. Apart from that, some of the subjects have different variation on their face such as wearing glasses in some of their portraits[6]. Therefore, this database is relatively applicable to this system since the required amount of sample portrait for each person by this system is also similar as the provided amount of portrait by the downloaded database.

4. IMPLEMENTATION AND TESTING

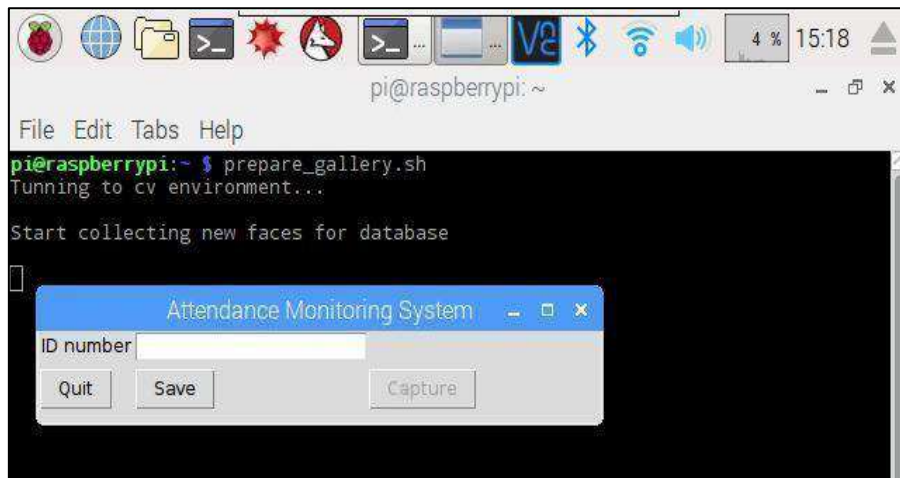


Fig. 2 Interface displayed when *prepare_gallery.sh* is executed

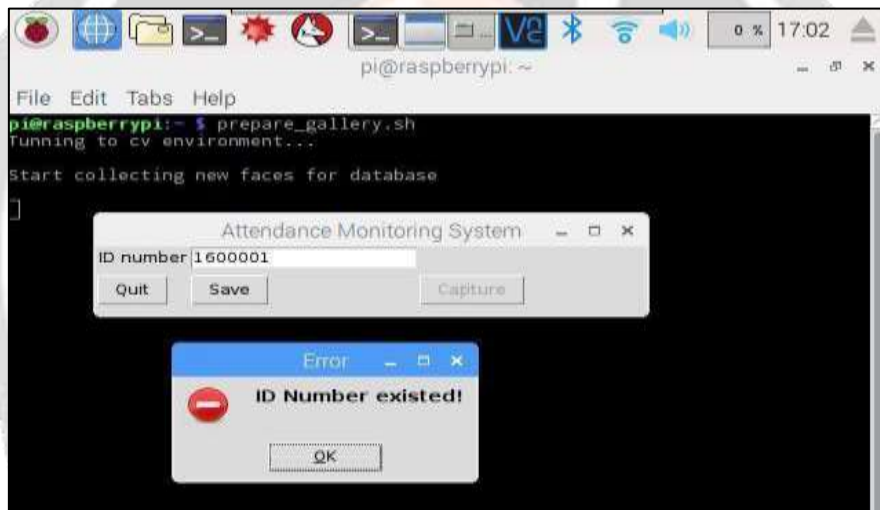


Fig. 3 Test result for invalid ID (1st attempt)

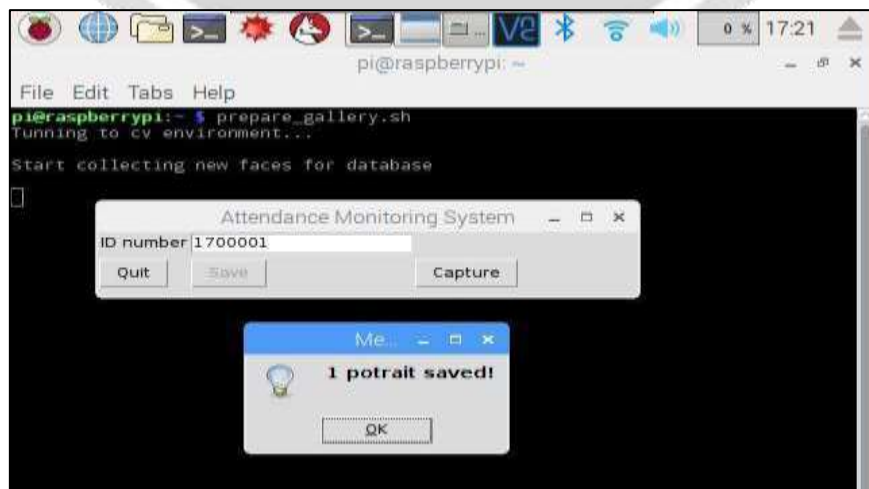


Fig. 4 Test result for valid face capture

5. CONCLUSION AND FUTURE SCOPE

5.1 Conclusion

After conducting this project, attendance can now be taken with a portable mini box (raspberry pi + pi camera) in a Wifi coverage area. This technology can reduce the effort of enforcing students to attend classes as everything is automated. Since Wifi coverage is not a problem for most of the institution, by using a mobile phone, the lecturer can enter the current class session's information into the Attendance Management System Webpage hosted by the raspberry pi to start the attendance taking process. This had provided convenience not only to the lecturer but also to the students because the attendance taking process for a class of approximately 100 students can be done in 5 minutes which is way more faster than the old method of passing attendance sheet around in the classroom which created a lot of issues to the institutions and inconvenience to the students. Other than that, this system provides excellent graphical interface to the user. Data accessing can be easier nowadays simply by logging in into the webpage where searching of a record can be done easily. This also reduces the need of the lecturer to keep on entering the attendance record manually into the system.

5.2 Future Scope

Since the development time for this project is very limited, the designed system only consists of the minimum function required for it to work. However, it can be further improved to maximise the usage of the raspberry pi to produce a better system. The followings are the further developments for the project to be improved.

- Provide a better domain name for the webpage.
- Improve the face recognition algorithm.
- Provide better search functions in the webpage.
- Develop a fingerprint recognition mechanism to enhance the recognition system.
- Improves the system so that it can eliminates the need of lecturer input before the recognition procedure can start.
- Improves the database so that it can also stores the information of the subjects taken by each student to facilitate the attendance marking procedure.

6. References

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