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Face Recognition Attendance System Based on Video Processing

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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 provide huge convenience to the authority as many process are automated.*

Keywords: Face Recognition.

I. INTRODUCTION

This is a project about **Facial Recognition-Based Attendance Monitoring System for Educational Institution**. In this chapter, the problem and motivation, research objectives, project scope, project contributions and the background information of the project will be discussed in detail.

1.1 Problem Statement and Motivation

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 bya 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 notbe 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**. 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. However in the previous system, there are no ways for the parents to access such information. Therefore, evolution is needed to be done to the previous system to improve efficiency, data accuracy and provides accessibility to the information for those legitimate party

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1.2 Research Objectives

In order to solve the drawbacks of the previous system stated in 1.1, the existing system will need to evolve. The proposed system will reduce the paper work where attendance will no longer involve any manual recording. The new system will also reduce the total time needed to do attendance recording. The new system will acquire individual attendance by means of facial-recognition to secure data accuracy of the attendance.

The followings are the objectives of this project:

- To develop a portable Smart Attendance System which is handy and self-powered.
- To ensure 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.

1.3 Project Scope and Direction

The main intention of this project is to solve the issues encountered in the old attendance system while reproducing a brand new innovative smart system that can provide convenience to the institution. In this project, a smart device will be developed which is capable of recognising the identity of each individuals and eventually record down the data into a database system. Apart from that, a website will be developed to provide visual access to the information. The followings are the project scopes:

- The targeted groups of the attendance monitoring system are the students and staff of an educational institution.
- The database of the attendance management system can hold up to 2000 individual's information.
- The facial recognition process can only be done for 1 person at a time.
- There will be two types of webpage interface after the login procedure for the admins and the non-admins respectively.
- The project has to work under a Wi-Fi coveraged area, as the system need to update the database of the attendance system constantly.
- The smart device is powered up by power bank to improve the portability of the device.

1.4 Impact, significance and contributions

Many attendance management systems that exist nowadays are lack of efficiency and information sharing. Therefore, in this project, those limitations will be overcome and also further improved.

The impact and the contribution of this project is as follow:

- Students will be more punctual on attending classes. This is due to the attendance of a particular student can only be taken personally where any absentees will be noticed by the system. This can not only train the student to be punctual as well as avoids any immoral ethics such as signing the attendance for their friends.

The institution can save a lot of resources as enforcement are now done by means of technology rather than human supervision which will waste a lot of human resources for an insignificant process.

The smart device can operate at any location as long as there is Wi-Fi coverage which makes the attendance system to be portable to be placed at any intended location.

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II. LITERATURE REVIEW

Traditionally attendance was taken manually which is very time consuming and often leads to human error. Additionally, there are many uncertainties towards the sources of the attendance records which in fact, most of the attendance records are not retrieved from the actual situation. The old method that uses paper sheets for taking student's attendance can no longer be used. Based on the research, there are many solutions that are available to solve this issue.

According to research journal "Attendance System Using NFC Technology with Embedded Camera on Mobile Device" (Bhise, Khichi, Korde,Lokare, 2015). 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 aunique ID during their enrolment into the college. Attendance of each class will then be takenby touching or moving these tags on the lecturer mobile phone. The embedded camera on thephone will then capture the student's face to send all the data to the college server to dovalidation and verification. The advantages of this method is where the NFC is simple to use,and the speed of connection establishment is very high. It indeed speeds up the attendancetaking process a lot. However, this system couldn't automatically spot the violation when theNFC tag is not personally tagged by the original owner. Apart from that, the convenience ofthe system which uses the mobile phone as the NFC reader was actually an inconvenience tothe lecturer. Imagine if the lecturer had forgotten to bring their mobile phones to work, whatwould be the backup procedure for the attendance to be recorded? Moreover, most of thelecturer will not likely to prefer their personal smart phones to be used in this way due toprivacy matter. Hence, unique information about the student like biometrics or face- recognition, which is guanine 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 Attendence 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 image is compared one by one with the face database to search for the worker's face where attendance will be marked when a result is found in the face database. The main advantage of 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. 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.

The third research journal "Fingerprint Based Attendance System Using Microcontroller and LabView" (Kumar Yadav, Singh, Pujari, Mishra, 2015) proposed a solution of using fingerprint to mark the attendance. This system is using 2 microcontrollers to deal with the fingerprint recognition process. Firstly, the fingerprint pattern will be obtained through a fingerprint sensor, then the information will be transmitted to microcontroller 1. Next microcontroller 1 will pass the information to microcontroller 2 to dothe checking with the database that resides in it. After finding a student's match, the detailsare sent to the PC through serial communication to be displayed. This design is good as itaccelerates development while maintaining design flexibility and simplifies testing. But again, this system is attached to a PC which make it not portable. Other than that, the database information cannot be accessible easily. Meaning that, for the parents whom areinterested in knowing their child's attendance cannot easily or conveniently access the information. Therefore, to provide accessibility of the student's information to the legitimate concerned party, the information can be uploaded to a web server for easy access. While the authentication for the appropriate access can be enforced through a login screen.

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According to the forth research journal "RFID based Student Attendence System" (Hussain, Dugar, Deka, Hannan, 2014), the proposed solution is almost similar to the first research journal where RFID technology is used to improve the older attendance system. In this system, a tag and a reader is again used as a method of tracking the attendance of the students. The difference between the first journals with this is where attendance's information can be accessed through a web portal. It provides more convenient for information retrieval

III. SYSTEM DESIGN

The design part of the attendance monitoring system is divided into two sections which consist of the hardware and the software part. Before the software part can be developed, the hardware part is first completed to provide a platform for the software to work. In the hardware part, the process of the raspberry pi's setup configuration will be briefly explained in this chapter. While in the software development part, there will be two major process flow which will be further discussed in Chapter 4.

3.1 Hardware 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

Raspberry Pi 3 set up procedure

When the raspberry pi 3 first arrived, its casing, pi-fan, and the pi camera are not assembled. Thus, the first thing to do is to screw the pi-fan in place on the casing provided
and next secure the pi board onto the casing by again tightening it withscrews. For the fan to work, it's end has to be connected to a 5v pin and a ground pin which are pin 4 and pin 6 respectively with the red-wired connector to pin 4 and black-wired connector to pin 6. Then, assemble the pi camera onto the raspberry pi by first lifting up the camera port's tabwhich is located between the Ethernet and HDMI ports on the raspberry pi to loosen it up, next insert the pi camera connector into the port with the silver

IV. 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.

Personal Insight

The raspberry pi is indeed a very powerful portable device that can perform many tasks to solve our every day's life problem. It is not only a mini computer, but it also allows embedded systems to work where huge computers are no longer needed to navigate simple yet helpful task. Throughout this project, I've learnt that building and hosting an own website is totally possible. I am a big fan of website design and development thus, it is a little unfortunate that I didn't manage to create a domain name for the webpage, however, it is possible to get it done without charges, thus, I would definitely explore more about this in the future to make use of this advantage. Although raspberry pi has limited

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resources, however its portability is the best thing to ever exist because I can actually manage or work on the project anywhere I want. Apart from that, I've learnt that phpMyAdmin is a very useful tool for managing a database, it provides a lot of convenient to me throughout the development of this project because it reduced the need to communicate with the database using sql language which can be disastrous if I am not fluent enough to handle it. Overall, this project had given me the chance to discover the world that can barely exist in the class. The thirst for solving each and every problem encountered in this project had made me acquire determinations towards responsibilities. If I am ever given the chance to work on such projects with a larger scales in the future, I will definitely take a leap into it.

Implementation Issue and Challenges

During the development of the project, there are several issues that cause minor hindrance to the development. Initially, a GUI is created to aid the user for storing their portrait for the formation of face database. To achieve that, an external library called guizero is downloaded to aid the creation of the GUI. However, there are many limitations to this library as it does not support the view of other image file type except for .gif image file type. Therefore, images cannot be displayed through the window. Besides that, there are many restrictions on the layout of the GUI window which makes the created interface undesirable. Thus, the usage of guizero is abandoned in later times which is then replaced by Tkinter.

Apart from that, before being able to test out the recognizer, there are insufficient faces in the created database as there are only a small amount of volunteer willing to help out to form the face database. However, this problem is overcome by doing some research on the internet which came out with the solution of using a pre-prepared face database that are downloadable from the internet. The downloaded face database is normalized and greyscaled, thus making the testing process very convenient.

However, in this project, the website developed can only be accessed locally by devices that are using the same network as the raspberry pi. This is due to the lack of administrative power to alter the institution's networking system. But, it is feasible/possible for the raspberry pi to gain access from an outer network if there is allowance from the authority to allow implementation of the port forwarding configuration.

It is also very challenging while dealing with the pre-processing of the captured image. Fortunately, those problems can be resolved by surfing through the internet for recommended solutions. In short, developing a face recognition system can be very easy when there is sufficient background knowledge of how those process worked because most of the complicated algorithm are provided in the library itself which only requires understanding in order to be able to integrate it into the developing system.

Contributions of this project

The attendance taking process had never been an easy task to every institution. The old method of using paper to collect the attendance had created numerous troubles to the institution. However, with the invention of this project using the raspberry pi to solve issues like this can somehow be very effective for the institution. This project utilized the presence of genuine characteristic in every student to conduct the attendance taking procedure which never been practised before in history. In directly, the achieved objectives of this project had induced the following effects.

- Students cannot sign the attendance for their friend.
- The process of attendance taking is now paperless where resources can be saved.
- Apart from resources, this system also saves a lot of time.
- Enforcement is done indirectly without human workforce.
- Students will be more punctual to class.
- It is almost impossible to sabotage the system.

By implementing this system, lecturer can just sit back and collect the attendance without worries.

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Further Developments

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.
- Expand the storage of the raspberry pi.
- 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.

Before the development of this project. There are many loopholes in the process of taking attendance using the old method which caused many troubles to most of the institutions. Therefore, the facial recognition feature embedded in the attendance monitoring system can not only ensure attendance to be taken accurately and also eliminated the flaws in the previous system. By using technology to conquer the defects can not merely save resources but also reduces human intervention in the whole process by handling all the complicated task to the machine. The only cost to this solution is to have sufficient space in to store all the faces into the database storage. Fortunately, there is such existence of micro SD that can compensate with the volume of the data. In this project, the face database is successfully built. Apart from that, the face recognizing system is also working well. A webpage is also successfully built with fully functioning feature which is user-friendly. The database built is hidden from the user, however they can still access and make changes to it through the developed webpage with excellent interface.

At the end, the system not only resolve troubles that exist in the old model but also provide convenience to the user to access the information collected which perfected the existence of technology to assist human's needs.

REFERENCES

[1]. Diepen, G. (2017). Detecting and tracking a face with Python and OpenCV. [online] www.GuidoDiepen.nl. Available at: https://www.guidodiepen.nl/2017/02/detecting- and-tracking-a-face-with-python-and-opencv/ [Accessed 19 Oct. 2017].

[2]. Docs.opencv.org. (2017). Face Recognition with OpenCV — OpenCV 2.4.13.4 documentation. [online] Available at: https://docs.opencv.org/2.4/modules/contrib/doc/facerec/facerec_tutorial.html#face database [Accessed 19 Oct. 2017].

[3]. Element14.com. (2017). Community: Raspberry Pi 3. [online] Available at: https://www.element14.com/community/community/raspberrypi/raspberrypi3/content?filterID=contentstatus[published]~objecttype~objecttype[document]&filterID=contentstatus[published]~language~language%5Bcpl%5D [Accessed 21Oct. 2017].

[4]. GitHub. (2017). iashris/Face-Detection-OpenCV. [online] Available at:https://github.com/iashris/Face-Detection-OpenCV/blob/master/FaceDet.py [Accessed19 Oct. 2017].