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Fingerprint Recognition Secure System Using IoT

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ABSTRACT: Basically attendance is the major requirement for students and employees. And this attendance is not accurate these days since many of the colleges prefer the traditional attendance system which is of pen and paper. Because of which the attendance can also be manipulated by faking the sign of the absent student by his/her friend. In this way the students will not have the accurate attendance. Because of this buddy signing people don't attend the college often and end up with poor academics. So, this kind of problem can be eradicated with the help of fingerprint recognition secure system using IOT since each and every person on the universe has a unique fingerprints which cannot be matched with any other person. So in this way fake signatures can be avoided and the accurate attendance can be awarded

KEY WORDS: Classification, Data Mining, Machine Learning, Predictive analysis, Social Networking Spam, Spam detection.

I.INTRODUCTION

Student academic attendance is very important since it will affect the students from gaining knowledge and skills as well as their grades. students end up with poor academics since the colleges prefer the conventional way of taking the attendance which is like taking the signatures of the students in a piece of paper which is not secure. Because the data can be lost if the papers are lost. But with the help of this project the data can be stored in the digital means which is confidential and cannot be lost. This project is related about the student attendance system through the matching of their fingerprint to confirm their attendance. The main purpose of completing this project is to develop a hybrid student attendance system that desktop-based application is developed to get the attendance of student by fingerprint and post the attendance results using web-based student attendance system. As per the project, there is one and only one fingerprint occurs in the world for each person which will never has duplication. So, fingerprint attendance system are often referred to as the simplest authentication to detect the individual student attendance record. In addition, consistent with the technology nowadays, it common place anymore to require the attendance of scholars through their fingerprint.

Most universities and colleges are still using the traditional attendance system which needs student to check in a bit of paper whenever they attend a category throughout the entire semester. Using the normal attendance system, can obviously see that there are few problems like it'll be no backup for the attendance records once the lecturer accidentally lost the attendance sheet, course mate help those that didn't attend the category sign the attendance which also referred to as buddy-signing also, hard in analysing and tracking student performances based on attendance factor, student lack of data and skills because of the poor attendance in attending classes, and etc.

It is important to overcome these problems since it will help in improving the academic performance of students as well as the teaching environment of the lecturers. Hence, the aim of completing this project is to stop unwanted situation occur and to seek out the issues that causes these problems and also find the solutions to overcome these problems. By implementing the developed system, lecturers will no more facing the empty classroom whenever while they're lecturing ahead the stage. Other than that, student won't be ready to ask their buddy to sign for them anymore since the



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system requires their fingerprint to prove their attendance within the class. In addition, it'll be easier to gauge and analyse the scholar performance supported their attendance since the system will record the attendance more accurately and efficiently with minimum possible error. Furthermore, student academic performance will increase and also since they can't fake their attendance through the developed system which suggests they need to attend all the classes so as to prevent them from getting bar. Last but not least, the system have included several modules which are attendance module, email module, report module, fingerprint module, schedule module, lecturer module, student module, and etc. in order to make sure the system can help in improving the scholar attendance as to provide the accurate and efficient information regarding the student/scholar attendance. As a conclusion, using an electronic based system is better than using a paper-based system in order to collect, process, store, and produce the attendance results and perform long-term analysis.

Throughout the entire semester, lecturer will only record and evaluate the student/scholar attendance through a bit of attendance sheet. Almost previous couple of weeks before the semester end, the scholar attendance are going to be key-in to the present system by lecturer so as to get the bar-list report. But if the lecturer lost the attendance sheet, which mean the record will be lost as well and lecturer will end up entering the correct attendance records to the system at the last few weeks of the semester.

Most of the time, lecturer facing a issue which the classroom is empty but the attendance list is full. It is because most of the scholar will only attend the class/category for the primary few weeks but after then they'll request their friends who always attend the class to help them sign the attendance. Since lecturer always busy in lecturing and haven't any time to see their attendance one-by-one, so students take advantages from now to assist their friends sign. In evaluating a private student academic performance, it's important to review back their attendance records. Attendance matters a lot to a student for posting the marks and without the proper attendance the student may lose in many ways in academics. Without correct and accurate student attendance, it's hard to gauge the important factor of poor performance. Student who is absent from the class will not be able to learn what lecturer had taught in the classes which may result them to know nothing about the subject and end-up with poor academic performances. Without the scholar participation during a class, they'll be unable to soak up what lecturer teaches within the class and an equivalent time, it'll affect the passing rate of that subject as a result.

II. BACKGROUND

Fingerprints are one of many forms of biometrics, used to identify individuals and verify their identity. The anatomy of fingerprints for matching purpose usually needs the comparison of many features of the print pattern. These include patterns, which are local characteristics of ridges, and minutiae points, which are unique features found within the patterns. It is also necessary to understand the structure and properties of human skin so as to successfully employ a number of the imaging technologies [2]. Minutiae and patterns are very important in the analysis of fingerprints since no two fingers have been shown to be identical [8]. The three basic sample of fingerprint ridges are the arch, loop, and whorl.

- Arch: The ridges will be starting from one side of the finger, rise in the center forming an arc, and then exit at the other side of the finger.
- Loop: The ridges enter from one side of a finger, form a curve, and then egress on that same side. The loop is like a circle.
- Whorl: Ridges form circularly around a core central point on the finger.

A fingerprint recognition system is often used for both verification and identification. In verification, the system compares an input fingerprint to the enrolled fingerprint of a selected user to verify if they're from the equivalent finger (1:1 match). In identification, the system compares an input fingerprint with the prints of all enrolled users within the database to check if the person is already known under a replica or false identity (1:N match). Recognizing multiple enrollments, during which an equivalent person obtains multiple credentials like a passport under different names, requires the negative verification functionality of fingerprints.

This project Fingerprint Recognition Secure System Using IOT includes arduino uno, R305 fingerprint module, 16*2 LCD, ESP8266, motor driver, and a DC motor. In which arduino uno is the heart of this embedded project which acts as a interface between the inputs and outputs. It communicates between the inputs and outputs. The power can be supplied to arduino uno by two means, one is using power jack and the other is using USB cable. In this project

arduino uno is supplied with power using a USB cable from a central processing unit. The microcontroller which is present in the arduino uno stores the information given through fingerprint module. Accordingly the arduino works. The inputs to the arduino are 5v power supply via type-B USB cable and R305 fingerprint module. The outputs to the arduino are 16*2 LCD, ESP8266 Wi-Fi module, L293D motor driver, and DC motor. Additionally a bread board is used for connecting extra 5volts and ground pins using male to male and female to female jumper wires.

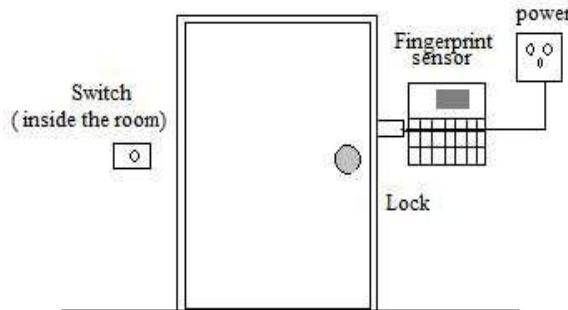


Figure1: Schematic of fingerprint secure system

Fingerprint processing involves two process: fingerprint enrollment and fingerprint matching. While enrolling, user needs to place the finger two times. The enrollment is done using arduino IDE in which the user needs to select 'enrol' from the tool box. The system will process the two time finger images, creates a template of the finger based on processing results and store the template. While matching, user enters the finger through optical sensor and system will provide a template of the finger and compile it with templates of the finger library. The fingerprint sensor is an optical type and its corresponding technique is 1:N. The speed of scanning is 0.5 sec and the speed of verification is 0.3 sec. The life of the sensor is 100 million times. The FRR(False Rejection Rate) is less than 1.0% and the FAR(False Acceptance Rate) is 0.001%.

III. DESIGN AND IMPLEMENTATION

The details of hardware and software implementation are described in this section.

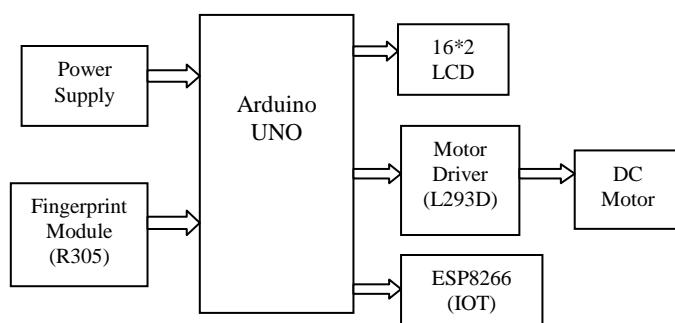


Figure2: Block Diagram of the Project

Hardware Implementation:

As shown in Figure2 we set the devices then connect them according to the block diagram. Tx-out and Rx-in of fingerprint sensor is connected to the pin 3 and pin 4 of the arduino UNO respectively. A 5v power supply is given to the arduino via a type-B USB cable. The input pins of motor driver are connected to the pin A1 and pin 8 of the arduino UNO and the output pins of motor driver are connected to the DC motor. The DC motor is not connected directly to the arduino UNO board because the power supply form the driver is not sufficient to drive the motor. Hence this motor driver takes the low current control signal from arduino and provides high current control signal that means motor driver amplifies the current signal and it can also drive the two motors simultaneously. The motor driver works on the basic principle of H-bridge, this motor control circuit allows the voltage to be flowing in any direction. The Dc motor is the device which converts the direct current into mechanical work. It is based on the principle of Lorentz Law, which says that "the current carrying conductor placed in a magnetic field experience a force". And that force is

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called the Lorentz force. A 16*2 LCD is used for displaying the details of the person. It displays the roll number of the person and the presence of the person. ESP8266 Wi-Fi module is connected to the arduino pins. This ESP8266 wifi module is a self contained system on chip and it is integrated with TCP/IP protocol stack which gives any microcontroller access to the Wi-Fi network.

Software Implementation:

First of all, some components used in this project works only if its library is present. To make the fingerprint sensor work, Adafruit fingerprint sensor library should be downloaded from the internet. Then only the fingerprint sensor support the whole system. Whereas, a 16*2 LCD also need a library which is LiquidCrystal and it is preinstalled in the arduino. For enrolling a new finger we put together a simple sketch and upload it to the arduino. Then follow this process which is shown in Figure 3.

Fingerprint Verification Process:

For verifying an en-rolled finger, we placed finger against that was already en- rolled. If arduino recognize that fingerprint, the door will unlock,otherwise the door remains locked.

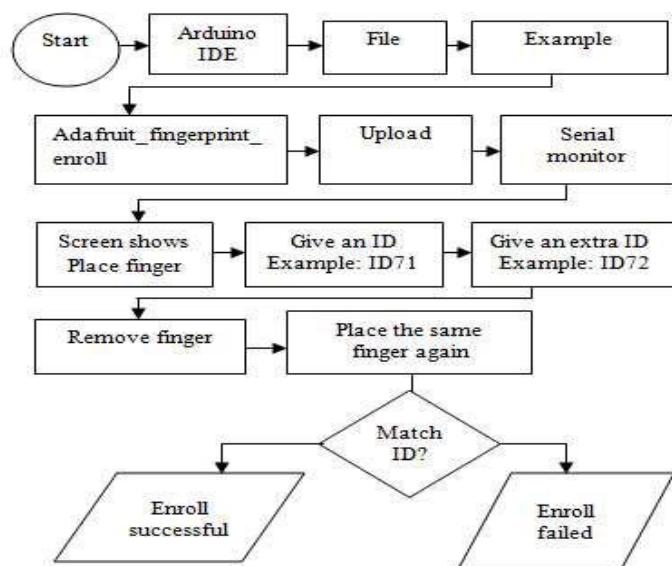


Figure3: Fingerprint enrolment steps

IV. RESULTS AND DISCUSSION

In this section, the results of this project is discussed. The components had undergone different tests individually to check whether they are working properly or not. After the tests are done we have collected the results to verify the functionalities of the individual components. Thereafter the whole system of the project is checked for any errors.



Figure4: LCD display when power is supplied

Whenever the whole kit supplied with power the first that is displayed on LCD is shown in Figure4.

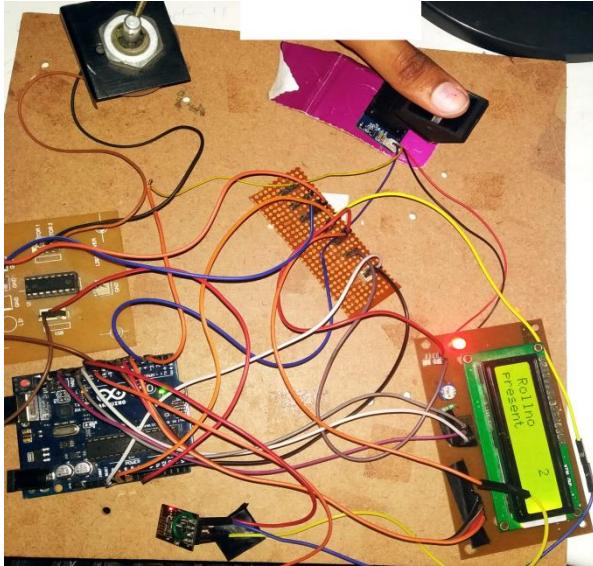


Figure5: LCD display when the finger is placed on the sensor.

The figure 5 shows the LCD display when the finger is placed on the fingerprint sensor. This displays the roll number of the student as shown in the figure and also displays the presence of the student or the candidate.

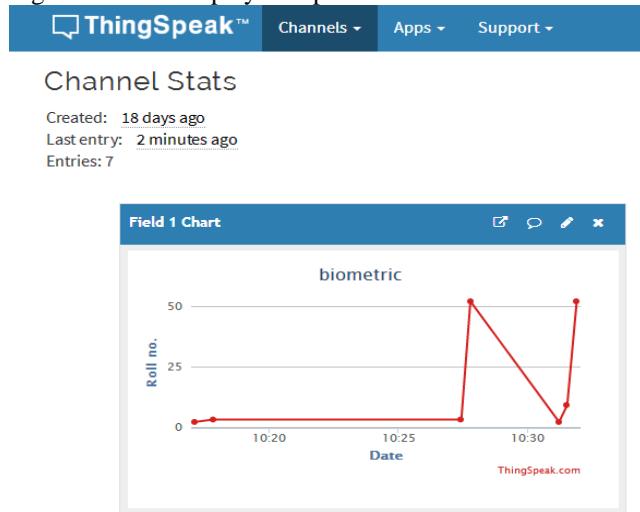


Figure6: ThingSpeak graph

On successful identification of the person ESP8266 wifi module will log the information to the cloud platform like ThingSpeak. This information of a person can also be displayed in the dashboard of ThingSpeak making it available for the required authorities to view and analysis information over the internet without having any direct physical access to the hardware.

By using IOT the data base will be stored in thing speak in the form of graph as shown in the above figure 6. The vertical axis represents the roll numbers of the candidate and the horizontal axis represents date.

The data base can also be seen on an excel sheet as shown below.

	A	B	C
1	created_at	entry_id	Roll No.
2	2020-01-29 10:17:07 IST	1	2
3	2020-01-29 10:17:50 IST	2	3
4	2020-01-29 10:27:26 IST	3	3
5	2020-01-29 10:27:47 IST	4	52
6	2020-01-29 10:31:13 IST	5	2
7	2020-01-29 10:31:32 IST	6	9
8	2020-01-29 10:31:54 IST	7	52
9	2020-01-29 10:45:42 IST	8	2
10	2020-01-29 10:46:40 IST	9	9
11			

Figure7: Output on excel sheet

V. FUTURE SCOPE

The developed system is very much flexible. The system we have created operates on only one lock, but in our current state, we can add more electronic locks, where each lock can be unlocked with specified print IDs. All it will need is more electronic locks and code modifications. There can be some other implementations to this system as well, some of them are given below.

A. Multi-lock/ Decoder networksystem

As mentioned earlier, this system currently has one lock connected to, and we can add up to 5 more. In fact, by using a network of decoders, we can connect as many locks as we want and provide access to up to 126 different individuals. A decoder network can be used with this system. Additionally, 6 different locks can be added. Instead of using those output pins from the no for locks, we can create a system using 7: 128 decoders. In that way, all the memory space of the fingerprint sensor (126 capacity), connect them to individual doorway or doorways with just one system.

B. Computerized Fingerprint locksyste

This system can be installed on a PC, which will act as the brain behind the system. It can add new IDs and delete old ones and can even unlock doors through the computer. This will require the computer to be in the security control room or somewhere secure. In particular a log system can be easily implemented with the use of a computer

VI.CONCLUSION

An attendance system which is presented above will greatly reduce the workload, save time for taking attendance at various places like schools, colleges. Similar applications can be used to create different applications for different purposes as well as enhancing the features of existing applications. Since internet has become an integral part of urban society it is easy available and sometimes the free access further eases the task of taking attendance and storing it on a remote database through internet.

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