A Foolproof Biometric Attendance Management System

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Abstract

In this paper, we proposed a system which maintains the attendance records of students automatically. Manual entering of attendance in log books becomes a difficult task and it also wastes the time. Reading out the names of each student, each hour destroys the precious time. So we designed an efficient module that comprises of a fingerprint sensor to manage the attendance records of students. Our module enrolls the student's as well as staff's fingerprints. This enrolling is a onetime process and their fingerprints will be stored in the fingerprint sensor. During enrolling of fingerprints alone we require a system since it is a onetime process. You can have your own roll number as your fingerprint id which will be unique for each student and staff. After enrolling process gets completed you can disconnect the module from the system and insert a 9v battery into the module. This will provide power when the module is not connected with the system. Then the module can be taken to the class and the presence of students can be get. The presence of each students will be updated in a database and the data will be passed to the server using Wi-Fi. If a student is absent for a particular class automatically a SMS will be sent to their parents. If a student is absent continuously for more than three days a message intimating the parents to meet the HOD will be sent automatically. So everything here gets automated. Also a unique username and password for staff members are given in a website we create and the website can display the student's details, their attendance percentage which makes the work simple. Also mails and messages can be sent by the staff members using that site to intimate any urgent messages to the parents.

1. Introduction

In the existing scenario, we have fingerprint sensors with attendance management system that can take attendance only once a day. It's not made for each hour and it's not automated. The disadvantage it has is, it doesn't send messages automatically whereas in our system it sends messages automatically. It reduces the time in a huge ratio when compared to the existing scenarios. Existing attendance management system don't calculate the attendance percentage of students. It just takes the presence. In our system it measures the time of presence and also the period he is present. Our module consists of components such as Arduino UNO board, Wi-Fi Shield, GSM Shield, Keypad, LCD Display, Adafruit Fingerprint Sensor and Raspberry Pi.

2. Related Works

Many related works regarding attendance management in schools, colleges and industries exists.

In [1], the attendance of each students are taken during both the examination times and also on regular hours.A fingerprint device is used and the attendance of the students are stored in the database. Authors in [2] developed a college attendance system using wireless ZigBee technology. The attendance report will be sent to the respective department HOD or class in-charge once in 15 days. The report can also be sent to the parents e-mail id.Some also used RFID to track attendance of the students. Authors in [3] designed a student metric card embedded with an RFID tag for tracking their whereabouts. When the metric card passes through the RFID reader, it will trigger the system to read the data from the RFID tag to the database where the access data can be viewed online by the management for monitoring purposes.Authors in [4] created an attendance management system mainly for employees. It records the attendance of employees once per day. Wireless attendance management system are also designed by some authors. In [5], attendance is managed wirelessly. Once the presence for a particular employee is taken through a biometric device, the presence is stored in the database through Wi-Fi.Authors in [6] created an attendance management system for students using a fingerprint sensor. The students will be notified their presence through a LCD screen which displays the relevant information each time he/she keeps the finger.

3. Proposed Methodology

3.1 Arduino UNO

This board acts as an interface to all the devices such as Wi-Fi shield, GSM shield, Raspberry Pi, Keypad, LCD Display, and the server in which we maintain the database.

3.2 Adafruit Fingerprint Sensor

For Security purposes we use this fingerprint sensor. This all in one optical fingerprint sensor will make adding fingerprint detection and verification super simple. These modules are typically safe – there is a high powered DSP chip that does the image rendering, calculation, feature finding and searching. We can enroll new fingers directly in the on-board FLASH memory. We also provide two LED's – a RED and a GREEN one. When the finger is placed the GREEN LED will blink and the rest of the time RED will be active.

3.3 Raspberry Pi

The **Raspberry Pi** is a credit-card-sized single-board computer. In order to use Raspberry Pi you will need to install an OS onto an SD card. We should insert a minimum of 4GB memory card or greater than that. Format the SD Card before inserting into it. As already said a number of shields can be mounted on Arduino including Raspberry Pi. The Arduino program is first uploaded into the board and it will get saved. Whenever the power is supplied, the Arduino runs the particular program uploaded. Since our device is a standalone device, we insert the program into the OS that we installed in Raspberry Pi and make it to run automatically so that it records the fingerprints and our device becomes automatic.

3.4 Wi-Fi Shield

The Arduino Wi-Fi shield connects your Arduino to the internet wirelessly. We should connect it to our wireless network following a few simple instructions to start controlling it through the internet.Now we program it to send the fingerprints taken and is sent to the server through this shield. All the data's that we get are sent through this. The staff is first asked to enter the day order, period number, and their fingerprint. It is then checked with the database and then the module is passed to the students. Then the students keep their fingerprints and their presence is stored in the database.

3.5 Keypad

The keypad is used to enter the period number and day order. This information will be passed to the database and then checks to which staff the percentage has to be calculated and to which period the presence has to be updated. This is also connected with Arduino and the programming is done using Arduino compiler.

3.6 GSM/GPRS Shield

The Arduino GSM Shield allows an Arduino board to connect to the internet, make/receive voice calls and send/receive SMS messages. The shield uses a radio modem M10 by Quectel (datasheet). It is possible to communicate with the board using AT commands. The GSM library has a large number of methods for communication with the shield.Through this, we insert a SIM to send SMS to the parents automatically. We do the programming in Arduino compiler to send messages automatically. If a person is absent, using this shield we can send SMS to the particular student's parents. Obviously this shield is also mounted on top of the Arduino.

3.7 LCD Display

We use JHD 204A display where four lines can be shown in the display. Whenever the student or staff keeps his finger his/her id will be displayed for confirmation. Also the inputs we give are shown in the display.

3.8 A Web Interface for Staffs

A web interface for staff members is created. Each staff is given a unique username and a password. They can view the student details, can manually send Mail or SMS, and they can see the attendance percentage of each students. They can also download the attendance details in excel sheet form and take printouts if needed. So this becomes fully automated and no job for staffs to calculate the percentage. It's very easy to calculate the internal marks of students.

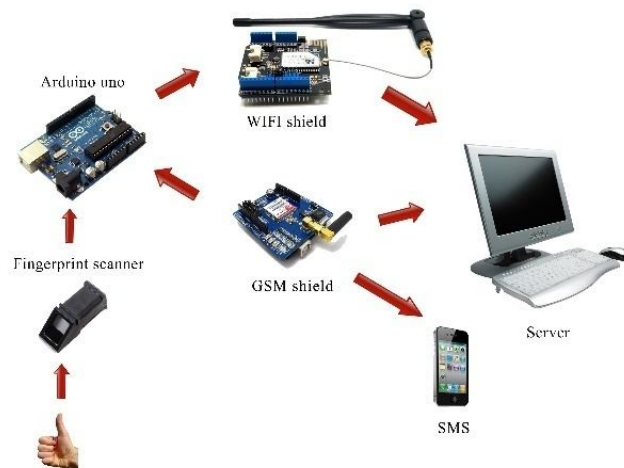## 4. Results and Discussions
4.1 Overall Architecture

Figure 1: Overall System Architecture.

4.2 Portable Foolproof Biometric Kit

Figure 2: Portable Foolproof Biometric Kit.

5. Conclusion

Instead of calculating the internals of a student in a excel sheet with formulas, maintaining log books for attendance everything becomes automated with our system. Our system is also cost effective. It comes around Rs.10000/- which includes all the components mentioned above. The advantages are more when compared to the present systems.

"Time is very precious at this moment so let's make ourselves move fast towards the automated world."

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