Biometric Attendance System

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Abstract - *Biometric Attendance System aims for better student record management. It can also be used for the staff of an institute too. The system consists of the fingerprint module, Ethernet shield, micro-controller and Web based UI for the maintenance by user or admin. The system acquires stores and checks the fingerprint of the student and sends the data to the server. The backbone of the entire system is an Arduino UNO micro-controller. Ethernet shield is used for immediate data transfer to the backend server. In this system, personal identification and attendance of the student is checked immediately through storage which helps the processing of the management department easy. The experimental results suggest that many fraudulent issues can be overcome using the fingerprint based attendance system and improves the reliability of the attendance records.*

Key Words: **Arduino UNO Board, Fingerprint Module, Ethernet shield, Web based UI, Database**.

1. INTRODUCTION

Biometrics is the emerging technology used for automatic identification of a person based on biological characters such as fingerprint, iris, facial recognition, etc. The fingerprint verification system is commonly used biometric technique. Fingerprint based technique use computer to store and verify fingerprints. This system consists of a fingerprint sensor which is used to detect the person's identification. For example, in educational institutions, the student needs to place their finger on the fingerprint sensor to obtain their attendance. The fingerprint captured is recorded in a flash memory and then each time it is checked whether the obtained fingerprint matches with the record in the flash memory after which the student gets the attendance. By making use of this system, we overcome the issues such as proxy so no student can give attendance for their friends who are absent. Our project aims to reduce overall cost of such systems. Also by making the systems truly portable we can reduce the average time spend by students on marking their attendance, as the portable device can be passed on student-by-student just like an attendance sheet, thereby avoiding the need to queue in front the system wasting their time. Timely reports can be automatically being generated and exported as excel sheets as well as generating a separate list of defaulters.

2. Hardware Details

2.1 Arduino UNO

An Arduino is an open-source microcontroller development board. The board features an Atmel ATmega328 microcontroller operating at 5 V with 2Kb of RAM, 32 Kb of flash memory for storing programs and 1 Kb of EEPROM for storing parameters. The clock speed is 16 MHz, which translates to about executing about 300,000 lines of C source code per second. The board has 14 digital I/O pins and 6 analog input pins. The Uno board can be controlled through the USB association or with an outer power supply. Outside (non-USB) force can come either from an AC-to-DC connector (divider wart) or battery. The board can work on an outside supply from 6 to 20 volts. The ATmega328 has 32 KB (with 0.5 KB involved by the boot loader). It likewise has 2 KB of SRAM and 1 KB of EEPROM (which can be perused and composed with the EEPROM library). Arduino has 14 digital pins. They work at 5 volts. Every pin can give or get 20 mA as prescribed working condition and has an interior draw up resistor of 20-50k ohm.
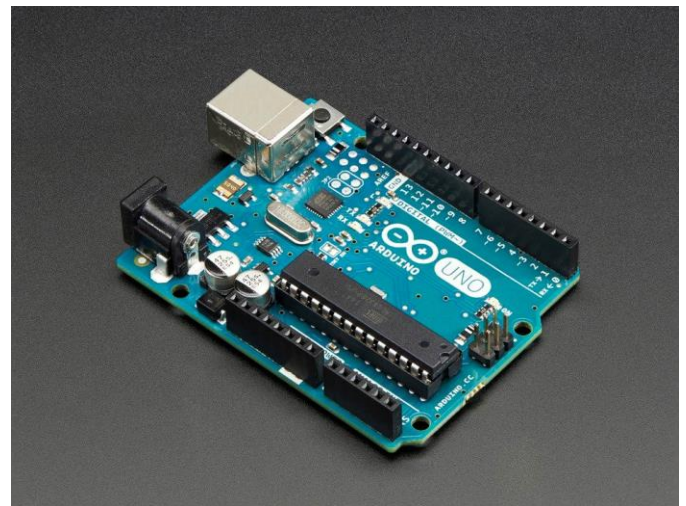

Figure 1: Arduino UNO Board.

2.2 Fingerprint Sensor (R305)

This is a fingerprint sensor module with TTL UART interface for direct connections to micro-controller UART or to PC through MAX232 / USB-Serial adapter. The user can store the fingerprint data in the module and can configure it in 1:1 or 1: N mode for identifying the person. The FP module can

directly interface with 3v or 5v Microcontroller. A level converter (like MAX232) is required for interfacing with PC serial port. Optical biometric fingerprint reader has good features and can be embedded into a variety of end products, such as access control, attendance, safety deposit box, car door locks.

Figure 2: Fingerprint Sensor (R305).

2.3 Ethernet Shield

The Arduino Ethernet Shield allows an Arduino board to connect to the internet. The Ethernet shield connects to an Arduino board using long wire-wrap headers which extend through the shield. The Ethernet shield connects to an Arduino board using long wire-wrap headers which extend through the shield. This keeps the pin layout intact and allows another shield to be stacked on top. It supports up to four simultaneous socket connections. The Wiznet W5100 provides a network (IP) stack capable of both TCP and UDP. Arduino communicates with both the W5100 and SD card using the SPI bus. This is on digital pins 11, 12, and 13 on the Arduino UNO. On both boards, pin 10 is used to select the W5100 and pin 4 for the SD card. These pins cannot be used for general I/O.
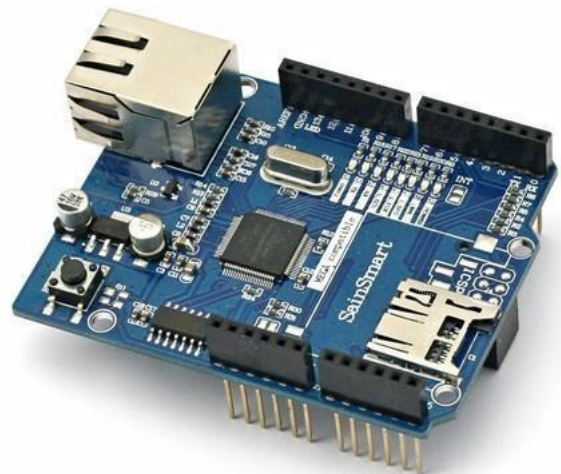

Figure 3: Ethernet Shield.

2.4 Database

A database is an organized collection of data, stored and accessed electronically. Database designers typically organize the data to model aspects of reality in a way that supports processes requiring information. The database management system (DBMS) is the software that interacts with end users, applications, and the database itself to capture and analyze data. A general-purpose DBMS allows the definition, creation, querying, update, and administration of databases.

A database is generally stored in a DBMS-specific format which is not portable, but different DBMSs can share data by using standards such as SQL etc. The sum total of the database, the DBMS and its associated applications can be referred to as a "database system". Often the term "database" is used to loosely refer to any of the DBMS, the database system or an application associated with the database.

Here we are using XAMPP Software which is a free and open source cross platform web server solution stack package developed by Apache Friends. It consists of mainly of Apache HTTP Server, Marie DB Database, and interpreters for the script written in PHP and Perl Programming language.

3. SYSTEM ARCHITECTURE

The system architecture diagram is shown in Figure below. The design of the attendance management system using fingerprint based biometric system comprises of the following modules:
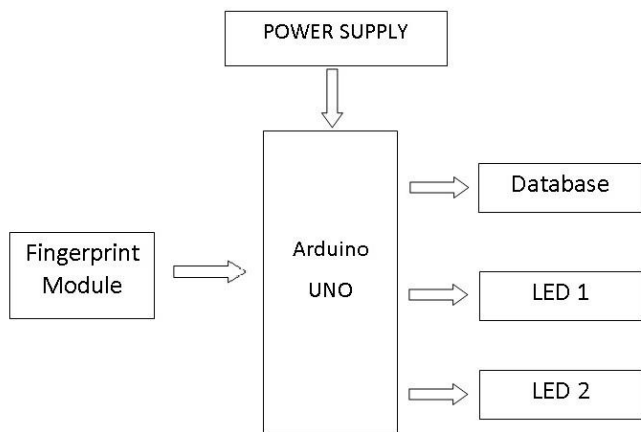
Figure 4: Block Diagram.

3.1 Power Supply:

Here we used +9V dc power supply from a battery. The main function of this block is to provide the required amount of voltage to essential circuits. +5V is given to ultrasonic sensor.

3.2 Arduino UNO

The main purpose of the microcontroller is to enrol and search the fingerprint. In enrolling, this controller read the template from the fingerprint sensor and enrol the ID number. This will display the ID number on serial monitor. And then, this controller checks the fingerprint with the stored template in the searching process. If the fingerprint is correct, the display valued are shown in database. Otherwise, the controller will not give any output.

3.3 Ethernet Shield

The Ethernet shield connects to an Arduino board using long wire-wrap headers which extend through the shield. The Ethernet shield is configured and connected to the router by a RJ45 cable. This connects the Arduino to the internet and our database. On both boards, pin 10 is used to select the W5100 and pin 4 for the SD card. These pins cannot be used for general I/O. On the Mega, the hardware SS pin, 53, is not used to select either the W5100 or the SD card, but it must be kept as an output or the SPI interface won't work.

3.4 Database

The database in the SQL server which will content all the detail of the students in their class. It will update the table with respect to the fingerprint scanned while entering the class. It will also note the time at which the student entered the class.
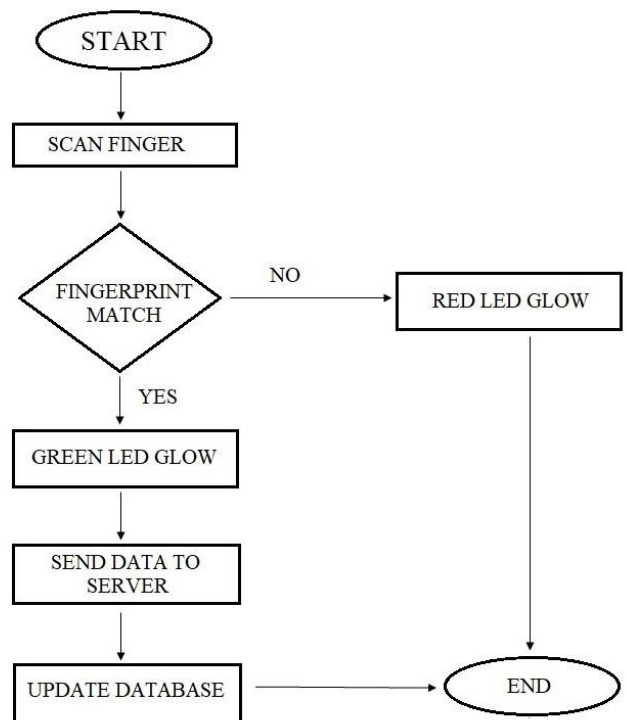
4. WORKING

Figure 5: Working Flowchart.

1. We enroll the fingerprint of the students and enter it to the database or our server.
2. After enrolling the fingerprints, when the class is about to start students will come one by one and start to mark their attendance using the fingerprint module.
3. The Arduino will compare the fingerprint enrolled with the current fingerprint.
4. If the enrolled fingerprint is correct then the Arduino will update the database marking the student present.
5. If the fingerprint is matches the green LED turns on if the fingerprint doesn't match with any of the enrolled fingerprints the red LED turns on.
6. It will also record the time of the student when he/she scans his /her finger in the database.

5. CONCLUSION

Biometric technology is an effective tool to verify identity and detect fraudulent issues. Analysis confirmed that the biometric data can be set and confirm the identity of the user. Expanding the use of biometrics will enhance the ability to detect fraudulent issues in the presence of the students in class or employees in an organization. In terms of efficiency and performance, the present work has provided a comparison with the traditional methods attendance system. By using the flash memory, the data is well structured. This system is user-friendly and very reliable. Therefore, it can be implemented either in organisations or educational institution.

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