

## A FINGERPRINT BASED STUDENTS ATTENDANCE SYSTEM WITH SMS ALERT TO PARENTS

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**Abstract-** Technological developments in the domains of electronics and telecommunication have led to an expanding variety of arrangements in the home and office. This project presents the design methodology for a mobile fingerprint-based student attendance system that utilizes a global system for mobile communication (GSM) technology. This course of study mostly entails matching fingerprints based on the number of minute pairings between two fingerprints and extracting minutiae points from model fingerprint pictures. The system has an attendance module and a terminal for collecting fingerprints. It is capable of autonomously carrying out tasks like fingerprint data collection and processing as well as wireless communication, creating an attendance record, and matching fingerprints. Following the attendance check, Through GSM, this technology transmits each student's attendance to their parent's mobile device. An attendance system makes it easier to obtain a specific student's attendance for a given class. This effort heralds a new era for parent alerts and student security.

**keywords:** GSM, Fingerprint, Enrolling, Attendance, Interface, Images

### I. INTRODUCTION

Attendance systems are crucial to every one of them primarily for official purposes, educational systems where complete maintenance of student attendance data is required safeguarded precisely. Consequently, it's critical to have an appropriate management system. There are several methods for recording attendance, such as having the teacher call out each student's name and mark those who are present. However, this method can be time-consuming in classes with a large number of students. Providing pupils with signed attendance forms is one option. The primary problem with this process is that students frequently sign and reply to documents on behalf of other individuals. Thus, the situations that were previously discussed can be avoided with the use of a fingerprint-based attendance system. Before starting this undertaking, several literature reviews are done [1-6]. Numerous iterations of the fingerprint attendance system concept have been developed, utilizing graphical user interface data processing software and various controller boards, such as Arduino and Raspberry Pi [7-12]. A fingerprint match is generally regarded as the most trustworthy form of identifying evidence in forensic science [13].

Three categories can be used to group fingerprint science: i) forensic medicine; ii) laboratory science; and iii) field science. The fields of forensic pathology, forensic psychiatry, forensic psychology, and forensic orthodontia are all included under the umbrella of forensic medicine. While the disciplines of biology, chemistry, toxicology, forensics, and fingerprints (target documents and impressions) are included in laboratory science, the disciplines of field science include crime scene

investigation, fire explosions, and locations where drugs are made and cremated. Since each fingerprint is distinct, no two people's fingerprints are exactly alike. Every finger can, in theory, provide a print for reasons of authentication. The 10 fingers do differ from one another, though which particular finger should be utilized for identification is not well-established. Although the thumb has a larger surface area, there is little evidence linking it to criminal activity. Traditionally, forefingers have been employed in non-military settings. One can often presume that the index finger produces the best results. The index finger on the right hand would be the ideal option because most individuals are right-handed [14-16].

A network modem that functions is termed a GSM modem when used with a GSM wireless network. An insecure system that functions similarly to a dial-up modem. A dial-up modem uses a fixed phone connection to send and receive data, while a wireless modem accomplishes the same task with radio waves. The main difference between the two kinds of modems is this. A GSM modem might be a PC Card, PCMCIA card, or an external device. An external GSM modem is often connected to a computer via a USB or serial connection. For a GSM modem to work, a SIM card from a cellular provider is required, similar to how a GSM phone works. Here, The ARDUINO-RTC-GSM interface was used to develop a fingerprint attendance system, which allows a person's fingerprint to be automatically identified once their ID has been recorded and gives precise dates and timings for the attendance that is entered into the system as well. The microcontroller boards' storage that is utilized determines the maximum number of distinct IDs that can be saved [17-20]. This paper is divided into 5 sections, the first section is about introduction, the hardware portion is covered in Section 2, the Section discusses the findings and Debate 3, in Section 4, the conclusion is explained, whereas the next projects are detailed in Section 5.

## II. HARDWARE SECTION

### A. Power of Arduino

An outside power supply or an Arduino Uno may be powered by a USB connection. The energy supply is selected automatically. Power sources for external (non-USB) devices include an AC-to-DC battery or wall-attack adapter. A center-positive 2.1 mm connector may be utilized to attach the adapter by placing it inside the electrical port on board. Battery leads can be connected to the power connection's GND and Vin pin headers. The board can run from a 6 to 20v external power. If provided with voltages lower than seven, the board might be unstable if the 5V pin supplies less than five volts, though. When used greater than 12V, the board might be harmed by the voltage regulator overheating. The recommended voltage range is 7 to 12 volts. The following power pins are:

- **5V:** This is the controlled power source that powers the board's microprocessor and other components. The power may come from an onboard regulator or the VIN. It can be powered by a controlled 5V source such as a USB connection.
- **3V3:** This represents a 3.3-volt supply generated by an onboard regulator. The maximum current draw for this supply is 50 mA.
- **VIN:** This is the input voltage when the Arduino circuit is powered externally, rather than receiving 5 volts via a USB connection or another controlled power source. Voltage can be supplied through this pin, or, if powering the device with the power jack, this pin can be used to access it.

- **GND:** This is the ground spline, which serves as a common reference point for the various electrical currents in the circuit.



Figure 1: Power A Arduino

### ***B. GSM Module***

The European Telecommunications Standards Institute (ETSI) created the Global System for Mobile Communications (GSM) standard to represent the protocols for 2G cellular networks that mobile phones utilize. Mostly, we have two kinds of SIM modules. The SIM 300 and SIM 900 are such. For our needs, the SIM 900A suffices in this case [21-23]. The SIM 900A is a sophisticated tool with a plethora of extra functions. In projects, the primary function of the GSM is to transmit and receive messages. Not only that, but we can use the GSM to browse and make calls. The operational voltage of the GSM is 12 volts. Three pins make up the majority of it: the transmitter, ground, and receiving pin. A GSM modem has to support the "extended AT command set" to transmit and receive SMS messages to carry out these functions. Among the most beneficial innovations of the contemporary era is GSM. It is superior to other technological standards in many ways. The benefits of GSM include.

- All across the world
- Traveling
- Security
- Reasonable equipment and amenities
- Wide ranges of frequencies achievable



Figure 2: GSM

### C. Fingerprint Module

Although the FPM10 fingerprint sensor module is being utilized in this instance, the majority of the connections and software are compatible with the R305 and ZFM-20 modules. The module processes images and enrolls fingerprints, fingerprint matching, finding, and storing templates. It is capable of 1:1 and 1: N matching.



Figure 3: Fingerprint Module

## III. RESULTS AND DISCUSSION

### A. Fingerprint Module

The fingerprint data reading, identification, and storage are all handled by the module. It is capable of receiving multiple commands for all of its operations. The module has 360° recognition capabilities and can store up to 200 distinct fingerprints. The fingerprint must be registered by sending the necessary commands for it to function. When the command is executed successfully, an acknowledgment is sent along with an error code; otherwise. It is even possible to take the print database from the unit and transfer it to different modules. It is also possible to obtain the fingerprints' raw photos from the module.

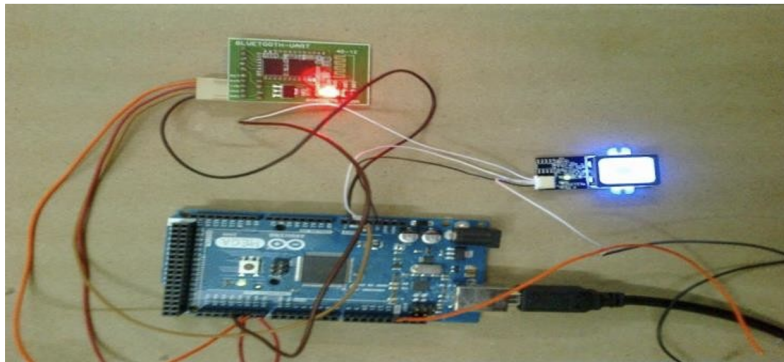


Figure 4: Hardware

### Enrolling

- 1) Start Enrollment (ID); // Send out a command to begin enrollment using the passed-in ID as a parameter.
- 2) Capture Finger; // Take a finger picture
- 3) Enroll1; // Make the first image's template
- 4) Take out and push the finger once more.
- 5) SeizeFinger;
- 6) Enroll2; // Make the second image's template
- 7) Take out and push the finger once more.
- 8) SeizeFinger;
- 9) Enroll Three; // Make a template for the third picture, then combine the three templates.

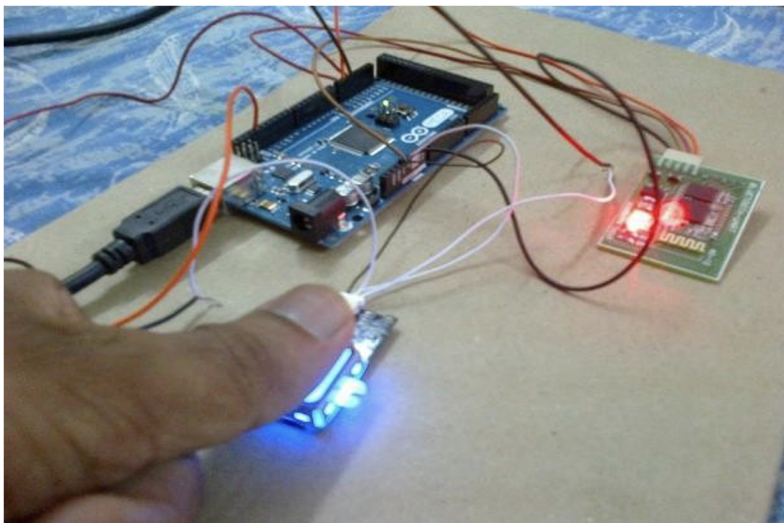


Figure 5: Enrolling of finger

## Verifying Procedure

- 1) Snatch Finger
- 2) Determine 1\_N
- 3) When (ID < 256) —Confirmed ID
- 4) Otherwise, Invalid Finger

## B. Connections

The fingerprint module features a four-pin JST-SH connection. A 3.3 V – 6 V power source is required. However, the voltage for Rx – Tx communication is 3.3 V. Thus, to keep the fingerprint module from connecting to the Arduino's 5 VRx – Tx, a potential divider is needed.

The following are the connections:

- Arduino Rx (Serial 2) → FPS Tx
- FPS Rx → Arduino Tx (Stepped down to 3.3V using a potential divider made of resistors rated at 560 and 1000 ohms)
- Gnd FPS → Test
- FPS VCC → 3.3 V

For proper synchronization, the Arduino and fingerprint module's serial connection speed is set at 9600bps. The default baudrate of the fingerprint module is 9600bps.

The following are some useful commands that were incorporated into the code:

- To open
- To Close
- Cmos Led
- Get Enroll Count
- Check Enrolled
- Enroll Start
- Enroll1, Enroll2, Enroll3
- Is Press Finger
- Delete ID
- Delete All
- Identify
- Capture Finger

## C. Software result

The software used is Arduino- Vision 1.8.1-windows7 Compiler and Assembler. Professional engineers may execute interactive simulations of actual designs using Proteus VSM, and benefit from this method of circuit modeling. Proteus 6

Professional is divided into two primary parts, which are Professional ISIS and Professional ARES. ISIS 6 Professional mostly engaged in simulation and circuit design. This system's code has been developed in assembly language. All that the Arduino language is a collection of C/C++ functions that you may use in your programming. After a few small adjustments (such as the automated creation of function prototypes), your drawing is sent straight to the avr-g++ C/C++ compiler. With Arduino, all common C and C++ constructs provided by avr-g++ ought to function. Examined the data displayed on the serial monitor of the Arduino Vision 1.8.1.

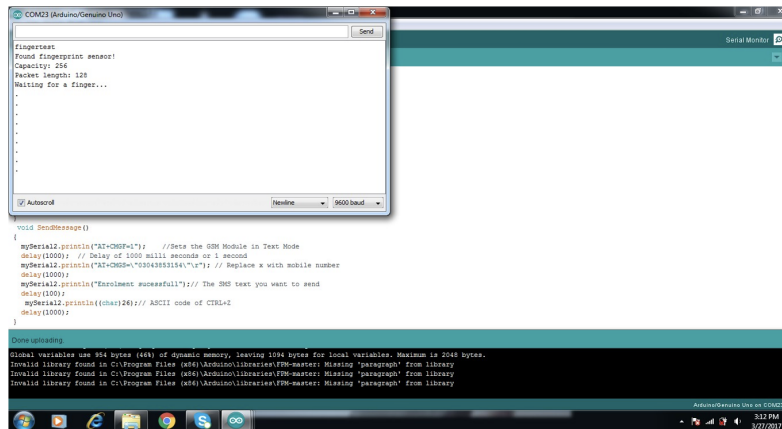


Figure 6: Serial monitor Fingerprint found

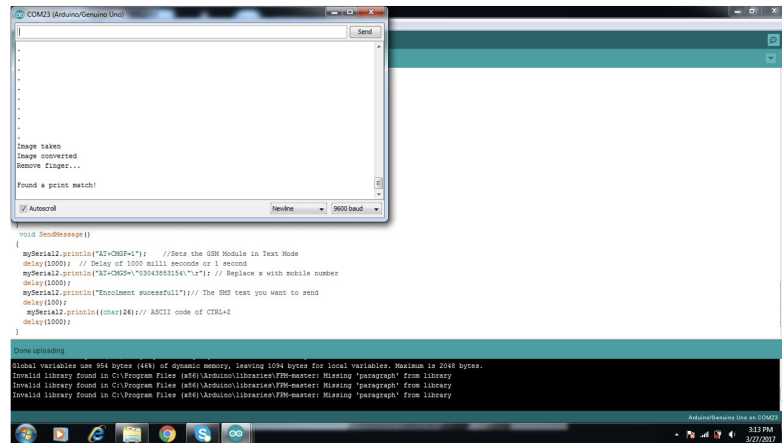


Figure 7: Serial monitor Fingerprint image Found

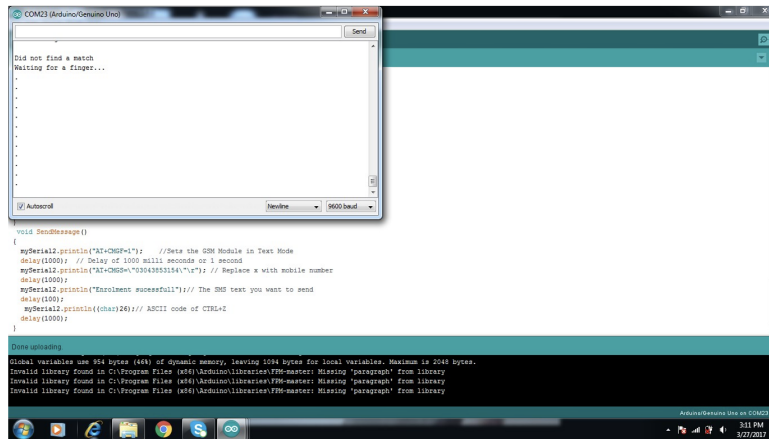


Figure 8: Fingerprint not matched

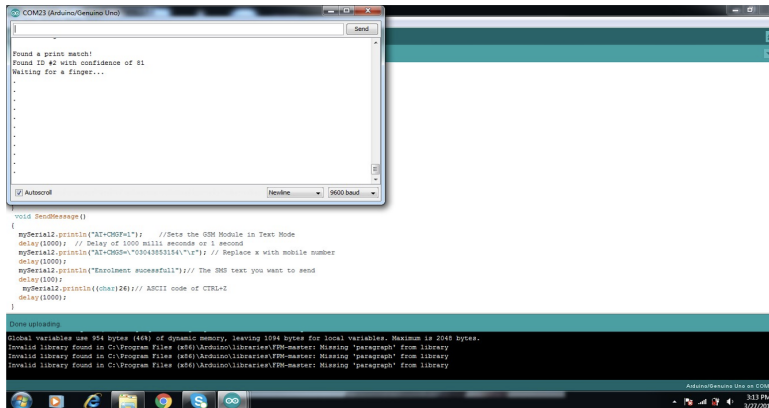


Figure 9: Fingerprint matched

Here checked out the data on the serial monitor of Arduino where first of all the module needs an image. After completing the enrollment process, students must deposit their fingerprints, the fingerprint scanner will save the data, and a verification system will compare the fingerprint characteristics captured with the data that was previously enrolled.

*D. Proteus work*

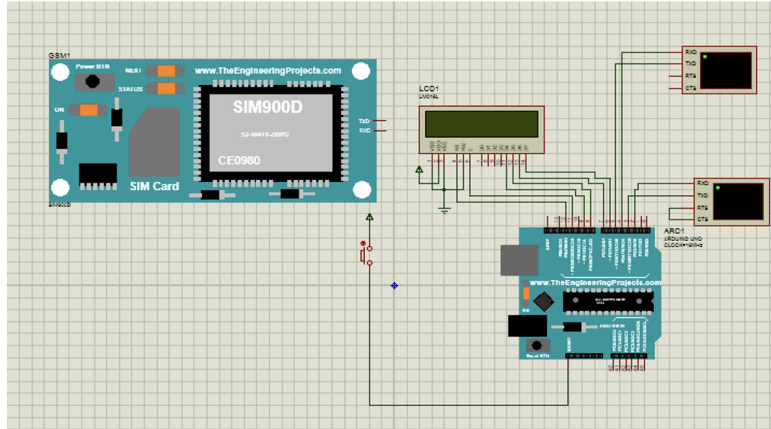


Figure 10: Proteus file

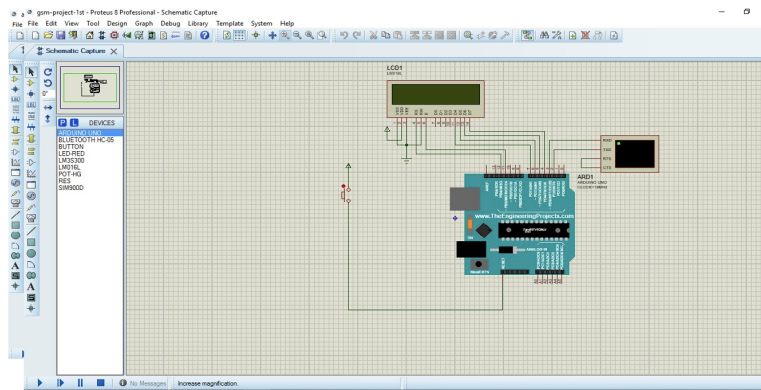


Figure 11: Interface of Arduino UNO and FPM

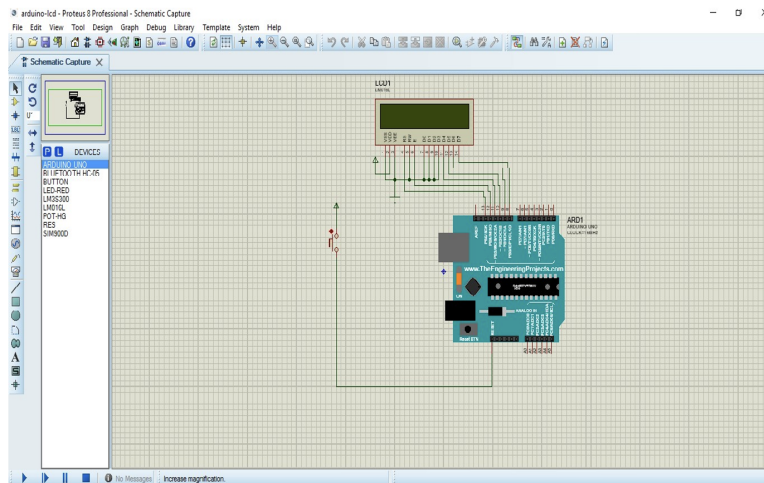


Figure 12: Interface of Arduino UNO and LCD

#### IV. CONCLUSION

Numerous problems were lessened by the approach, including the possibility of cheating while documenting attendance, which facilitates professors' ability to maintain student data' Additionally, the encryption method increases security by preventing any anonymous fingerprint from altering the data that has been captured, moreover, the mobility eliminates the need to wait in line to take attendance, saving time. For a variety of courses, this wireless fingerprint attendance system provides a sophisticated and effective approach to monitoring students' attendance in class throughout the course of the semester. It also offers a simple interface for retrieving comprehensive data on pertinent inquiries. A professor can use this attendance system to obtain a specific student's attendance records for the whole semester, in a matter of seconds, the entire class's attendance for a given day and the entire class's attendance for the entire semester are tabulated. Microsoft Structured Query Language (SQL) Server 2005 was used as the backend and Microsoft C# on the .NET framework was used to develop the fingerprint-based attendance management system. Future work can involve building a student database with the student's academic information in it. We can occasionally transmit the parent's mobile phone to the student's academic information as well as the attendance report. Therefore, finger vein recognition â which is significantly different from fingerprint authentication - will soon be able to be used in this attendance system. Human odor may also be used for security purposes to increase the authentication's level of security. In this project, we've used fingerprint techniques that can offer extremely high levels of security in places like homes, offices, banks, etc. This research finds a high-level paradigm for modifying current security systems with a PIN and fingerprint technique, among other security protocols. As a result, we used fingerprint recognition to develop the security console.

#### V. FUTURE WORK

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### CONFLICTS OF INTEREST

The author declares no conflict of interest.

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