

# Implementation of Enhanced IOT Based Biometrics Attendance System using R307 Fingerprint Sensor with Arduino UNO and Real Time Database to Improve Accuracy

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**ABSTRACT:** This study has mainly focused to develop IOT based biometric attendance system, that is able to keep record of attendance and count the data for daily purpose. In this research we are going to design Fingerprint Sensor Based Biometric Attendance System using Arduino. Simply we will be interfacing fingerprint sensor with Arduino and real time database to design the desired research. In this research, we are using fingerprint Module and Arduino to take and keep attendance data and records. Attendance systems are commonly used systems to mark the presence in offices and colleges. From manually marking the attendance in attendance registers to using high-tech applications and biometric systems, these systems have improved significantly. This research has a wide application in school, college, business organization, offices where marking of attendance is required accurately with time.

**Keywords:** IOT, Arduino UNO, NODEMCU, R307.

## I. INTRODUCTION:

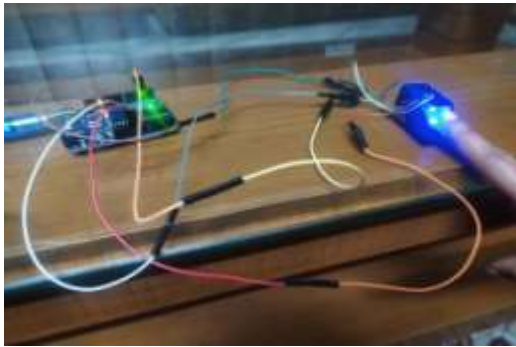
Biometric techniques can be used to solve these problems. Biometric is derived from two Greek roots "bios" meaning life and "metrics" meaning measurement. Biometric technology identifies a person uniquely based on his/her characteristics which can be physiological or behavioral. Among the various biometric techniques, there are nine main biometric techniques which are widely used. These include fingerprint, face, hand vein, hand geometry, iris, retinal pattern, voice print, signature, and facial

thermo grams. Comparison of different biometric techniques has shown that fingerprint biometric is a reliable, mature and legally accepted biometric technique. Therefore, Fingerprint based attendance system can be used for identification of large number of students in universities and also for attendance monitoring of employees in organizations.

## II. R307/R305 FINGERPRINT SENSOR MODULE

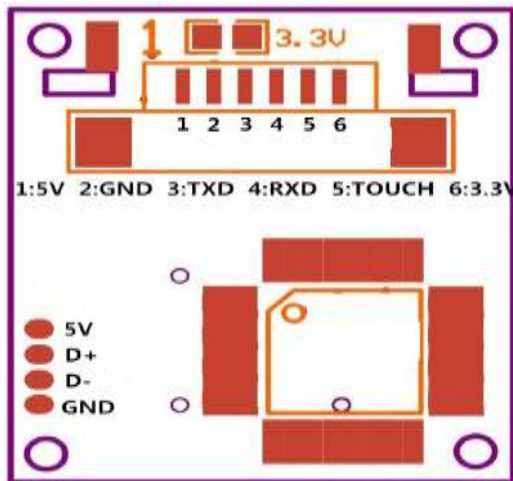
This is a fingerprint sensor module with TTL UART interface for direct connections to microcontroller UART or to PC through MAX232 / USB-Serial adapter. The user can store the fingerprint data in the module and can configure it in 1:1 or 1: N mode for identifying the person.

The Fingerprint module can be directly interfaced with any microcontroller as well as Arduino Board. This optical biometric fingerprint reader with great features and can be embedded into a variety of end products like access control system, attendance system, safety deposit box, car door locking system.



**Fig. 1: Shows Arduino Microcontroller and R307 Finger Point Sensor**

### III. EXTERIOR INTERFACE R307 FINGER POINT SENSOR



**Fig. 2: Shows R307 Finger Point Sensor**

### IV. ARDUINO UNO

Arduino is an electronic platform that is open source, based on the software and hardware that is easy to use. Arduino Uno is an electronic board containing a microcontroller or a puck that is functionally acting as a computer. Specifications of this tool is to use ATmega328P microcontroller with 5V voltage, its input voltage 7 ~ 12V transient voltage to limit its 6 ~ 20V, has approximately 32KB flash memory, has a 68.6mm long, 53.4mm wide and weighs 25g.



**Fig.3 : Shows Arduino UNO Microcontroller**

### V. OBJECTIVES OF THE STUDY

1. To study the literature to implementation of R307 Fingerprint Sensor, Arduino UNO controller , IoT devices , ARDUINO IDE 1.8.16 and CoolTerm Tool.
2. To fully eliminate the manual attendance system and to provide highly accurate and secured online attendance system based on IoT.
3. To provide online real time database of the attendance system using IoT.

### VI. RESEARCH METHODOLOGY ARDUINO IDE

Arduino IDE is a hassle-free, simple, and straightforward programming environment. With a community-driven system and simple interface, the program makes it easier to code websites and applications. You don't need to have any technical skills or knowledge to use beginner-friendly software. In order to code, people need to take years of courses to understand even basic concepts. Compared to Euphoria, Visual Studio, and Atom, Arduino IDE makes it easier to practice the knowledge you've gained, while also learning from a solid community of software engineers and other professionals.

### COOLTERM

CoolTerm is a simple serial port terminal application (no terminal emulation) that is geared towards hobbyists and professionals with a need to exchange data with hardware connected to serial ports such as servo controllers, robotic kits, GPS receivers, microcontrollers.

## VII. CIRCUIT DIAGRAM OF PROPOSED WORK

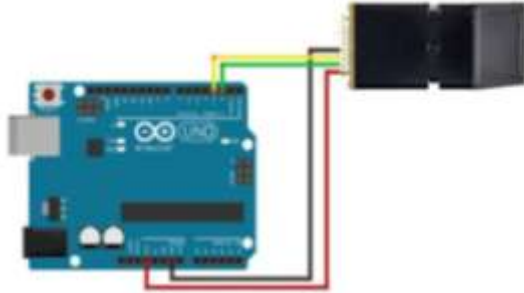


Fig. 4: Circuit Diagram of Fingerprint Sensor Module R307 with Arduino UNO

## VIII. PROPOSED ALGORITHM

Biometrics technology can solve these problems and proposed fingerprint based attendance system would be ideal for implementation in universities/Colleges/Schools/Office for identification and also by organizations for attendance monitoring of their employees. Proposed system is designed using Arduino UNO and optical fingerprint acquisition module. Finger prints are unique in nature, it gives attendance for only those who gave fingerprint while attendance time. Wi-Fi module is used for immediate data transfer to the backend server. A data, which is the student ID is sent to the microcontroller will be attendance data in the database is used to create many types of reports like specific day attendance, current day attendance, monthly attendance, weekly attendance, complete attendance and real time.

## IX. FLOW CHART OF PROPOSED ALGORITHM

### Registering And Storing The Fingerprint

The Fingerprint Module is interfaced with the Arduino Uno Microcontroller. The Fingerprint Module scans the fingerprint of the user and stores the image of the fingerprint in the memory. The time and date at which we have stored the fingerprint is determined by the RTC Module which is also interfaced with the Microcontroller. Figure (4.5) shows the flow chart for registering the fingerprint.

### DISPLAYING THE STORED RESULT

After storing the fingerprint, the user will again scan his finger for the fingerprint to be displayed on the serial monitor as a fingerprint ID. If the fingerprint matches the fingerprint saved in memory (EEPROM) then the ID is displayed with specific time and date.

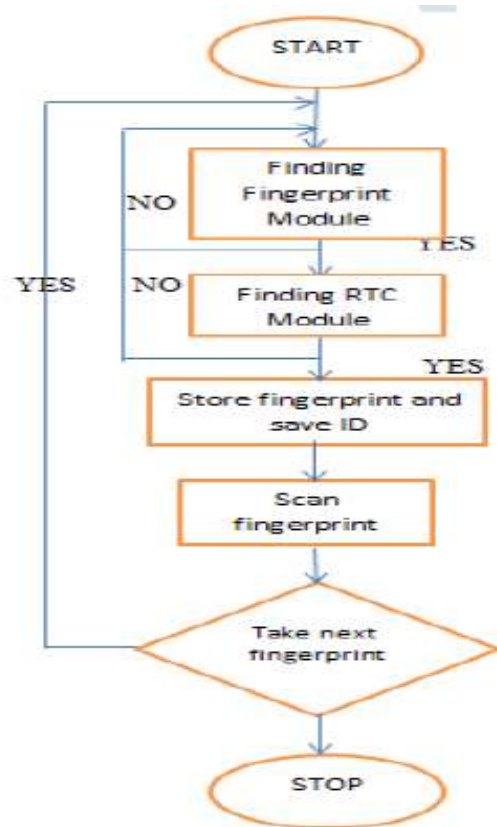


Fig. 5: Flow Chart for registering the fingerprint.

Table 1: Fingerprint Sensor Matching Test of User ID 44

Fingerprint Match Testing	Result in Confidence
1	169
2	158
3	147
4	126
5	112
6	118
7	165
8	145
9	134
10	178

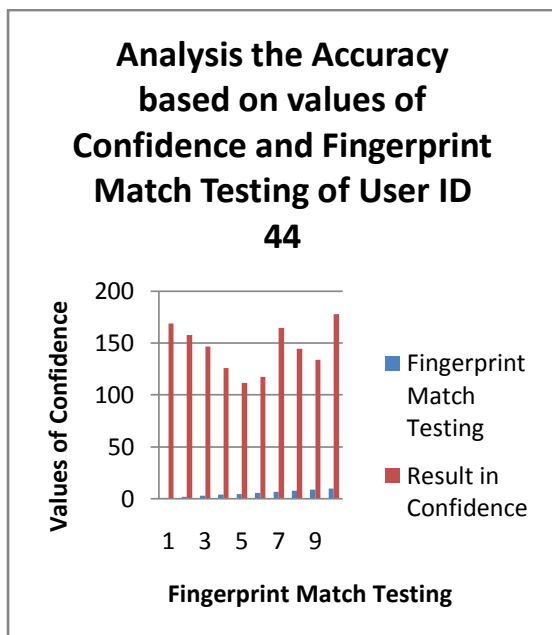


Fig. 6: Analysis the Accuracy based on values of Confidence and Fingerprint Match Testing of User ID 44

$$\text{Percentage of Accuracy} = \frac{\text{number of successful fingerprint matching}}{\text{total number of fingerprint test data}} \times 100\%$$

$$\text{Percentage of Accuracy} = \frac{10}{10} \times 100\% = 100\%$$

## X. CONCLUSION AND FUTURE SCOPE

Online Biometric systems have replaced the manual and unreliable systems by presenting reliable, secured, fast and efficient system. This research consists of one of those systems. Fingerprint based online attendance system will help to detect the presence of student and employees in schools, colleges and offices etc. It is user friendly and reliable and most of all it displays the time and date to check whether the user is on time or late. It also displays ID numbers on excel sheet. This Excel sheet can be saved and is used to calculate the attendance of the User. Hence, a system with expected results has been developed but there is still need for improvement. Further enhancing the system the designed system can be interfaced with camera and GSM module through which we will be able to send SMS to the parents/security persons/concerned staff so as to take care of the attendance if any false entry is made or when recognized by unauthorized user.

This enables the added advantage to the person concerned/in-charge for monitoring attendance of students/employees. Through this the institute/organization is all time ready with the record of attendance of all the students/employees anytime.

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