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Biometric Student Attendance System using IoT

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ABSTRACT

In the World of Technology, Biometrics plays an effective role in identifying Human beings. Through this paper, we will develop a unique system that can identify students for attendance purpose using their fingerprints.

We will need an Arduino Uno board for interfacing microcontroller with the Finger Print Scanner R305. So, with the help of Finger Print Scanner R305, we will store the finger prints of all the students and once they are stored, the Finger Print Scanner will compare the present finger print on the scanner and previously stored finger prints. If any finger print is matched, the microcontroller will print the concern data stored for the particular finger print on the LCD Display. In addition to this, we can add Wi-Fi module, to upload the data into remote IP address, to access it from anywhere in the world.

***Keywords*: *Biometric, Fingerprint, IoT, Wi-Fi Module*.**

I. INTRODUCTION

Here we propose a smart fingerprint based biometric attendance system that works over IOT so that attendance can be monitored from anywhere in the world. Our system uses a microcontroller-based circuit with fingerprint sensor, push buttons, power supply, power supply and Wi-Fi modem to interact with internet-based system. We here use IOT to develop the online attendance display system. Our system allows users/employees/students to first register their fingerprint on the system. After successful registration the print is stored in system with class assigned using push buttons. The system also displays these details over LCD display. Now as soon as the next time a registered user scans the modem, the system checks for authentication and authenticated user's data is transferred online to IOT using the gecko development API codes. Now the online system stores and displays the required data to users as per online login. Thus, our system allows for remote monitoring of biometric based attendance from anywhere over IOT.

II. REVIEW OF LITERATURE

One of the main aims of this research is to empower biometrics as an authentication method for security purposes like authenticating for cloud services, unlocking a door, accessing a particular service etc. taking into account the privacy and security challenges that face biometrics when used for remote applications. But the first question to be addressed is: why enable biometrics for authentication?

Abdullah Abdulaziz Albaldah has written in his thesis the security and usability problems [5] of password-based authentication, which is the most commonly used authentication method for secure access, have been reviewed. Many theoretical studies in the literatures show that password-based authentication suffers from a wide-range of attacks

including brute force, dictionary, sniffing, shoulder surfing, phishing, and key-logger attacks. In addition, human elements add additional security weaknesses to the password-based authentication. For example, users are likely to write down their passwords, use the same password across-multiple systems, use the same password over a long period of time, and share their passwords with their co-workers, family members, or friends.

Sagar Wale, S.A. Patil and Liu Ji has concluded in there paper that the wireless fingerprint attendance management is based on biometrics and wireless technique solves the problem of spurious attendance and the trouble of laying the corresponding network. It can make the users' attendances more easily and effectively [2] [4].

Quratulain Shafi stated in his paper that enrolment of fingerprints is done on the Server using Digital Persona Fingerprint USB Sensor and verification is done on the client with the transmission of fingerprint templates over the network. In this system attendance report is generated automatically and is further forwarded to faculty members via Email.[3].

III. PROPOSED SYSTEM

The proposed system involves a biometric attendance system that integrates an Arduino Uno board and a fingerprint scanner. The fingerprint scanner processes the user's fingerprint to verify the student's attendance.

To Enroll a new candidate, we'll have to use the enroll button and then place the finger of new candidate on finger print sensor such that the finger is scanned & data is stored in that candidate's name on our IP address.

To verify an already enrolled candidate we'll use a verify button, after pressing the verify button candidate must have to place finger on the fingerprint sensor so that the system can verify from the data it already stored

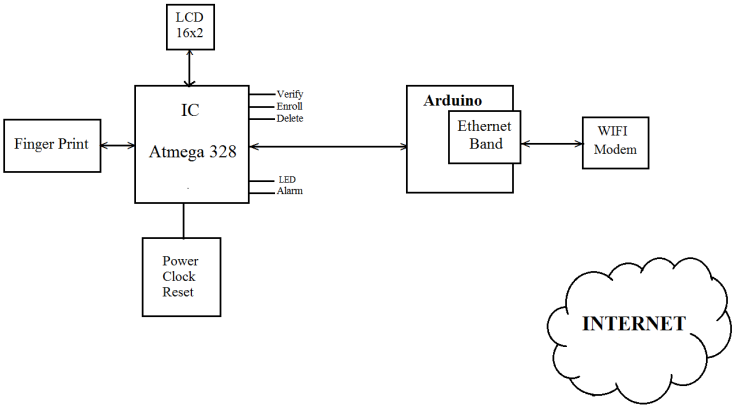

Fig. 1 Proposed System

IV. COMPONENT SELECTION

Fingerprint Scanner

While biometrics and fingerprint identification has been existing for well over 100 years in some basic form, it is the growth of maker community that made modules like R305 and SM630 so popular. R305 and S630 are common modules used for fingerprint scanners, with the aid of a powerful DSP in its core. Basically, both of these modules work the same way, we can communicate with them using a packet of hex codes in a specific format. However, the commands for operation can vary from module to module, for which we should have its datasheet. Well, for now we have the R305 here, just tested it with the products demo software from SFG. Though these have no good English

documentation, SFG has done a real good work with the demo software (except the bad UI) This is a finger print sensor module with TTL UART interface for direct connections to microcontroller UART or to PC through MAX232 / USB- Serial adapter.

ATmega328/P Microchip

The ATmega328/P provides the following features: 32Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 1Kbytes EEPROM, 2Kbytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, Real Time Counter (RTC), three flexible Timer/Counters with compare modes and PWM, 1 serial programmable USARTs , 1 byte-oriented 2-wire Serial Interface (I2C), a 6- channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages) , a programmable Watchdog Timer with internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next interrupt or hardware reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator oscillator is running while the rest of the device is sleeping.

Arduino Uno R3

Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

The Arduino Uno is a microcontroller board based on the ATmega328. Arduino is an open-source, prototyping platform and its simplicity makes it ideal for hobbyists to use as well as professionals. The Arduino Uno has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

The Arduino Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 microcontroller chip programmed as a USB-to-serial converter.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Arduino Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform.

Wi-Fi Module

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each SP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi ability as a Wi-Fi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost-effective board with a huge, and ever growing, community. This module has a powerful enough on-board processing and storage capability that allows it to be integrated

with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the frontend module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces; it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

V. IMPLEMENTATION & RESULT

A. Fingerprint Enrolment

In the enrolment process, the fingerprint of each student is recorded. The fingerprint of the student is scanned using the fingerprint scanner in the system. Each fingerprint is assigned an ID number and name of student. The ID number is stored on the Arduino board. This number is unique for each student. Enrolment of fingerprints is performed only once. The student names can be changed or replaced as and when required.

B. Fingerprint Comparison and Recognition

The system, being portable, can be passed around during the lecture from student to student to record attendance. During the fingerprint comparison and recognition process, the student's fingerprint will be compared with the stored fingerprints in the Arduino board. During this process, 'Fingerprint Verify' this message will be displayed on LCD. This will indicate to the student that the system is ready to take fingerprint input. The student then has to place his/her finger on the fingerprint scanner. The fingerprint input is then verified with the stored fingerprints.

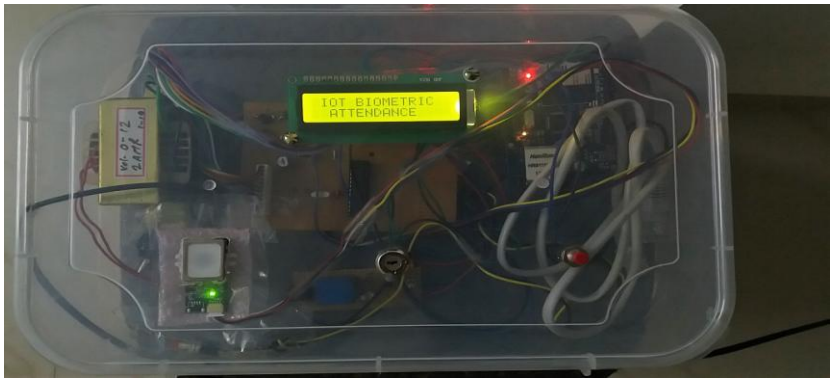

Fig. 2 Ready for Input.

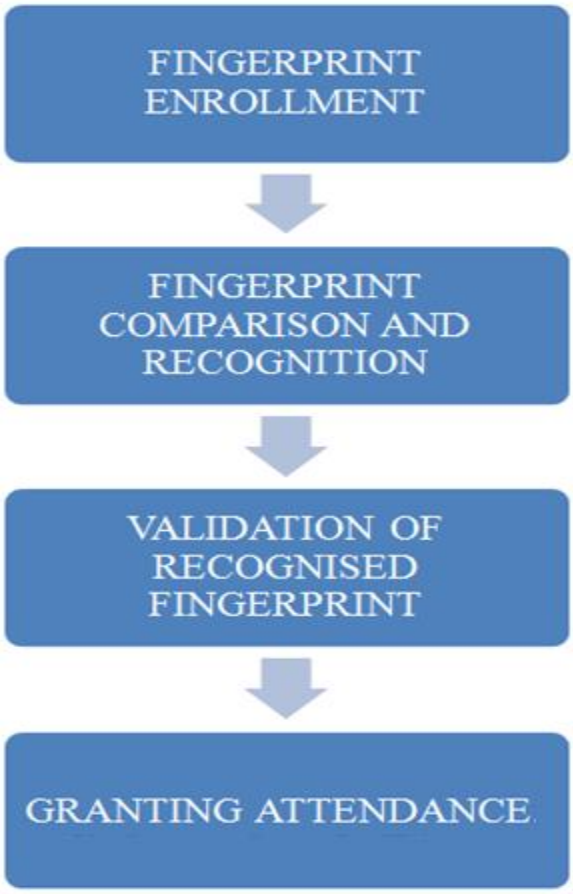

Fig. 3 Implementation

C. Validation of Recognized Fingerprint

In the previous process, the fingerprint input is compared with the stored fingerprints. If it matches a fingerprint present in the Arduino, then Student's ID no. will be displayed on LCD. This will indicate to the student that the fingerprint has been recognized successfully. Otherwise, 'No Fingerprint' message will be displayed. This will indicate that the fingerprint does not match any stored fingerprint. The student can then try again, starting the Fingerprint Comparison and Recognition process again.

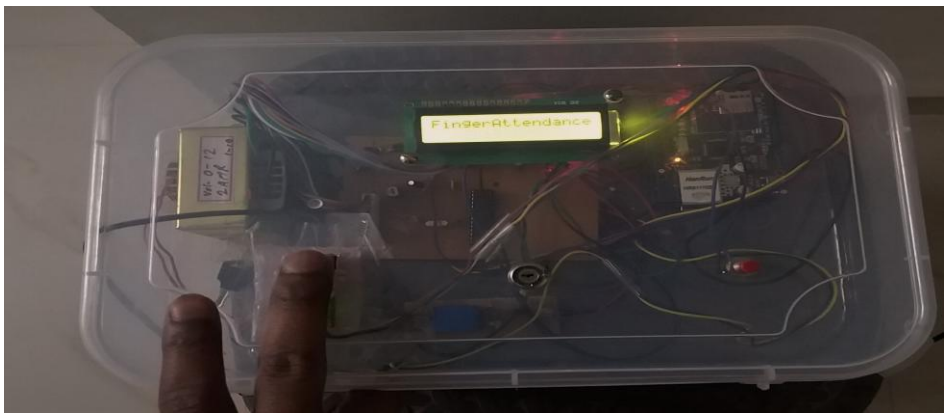

Fig. 4 Fingerprint Verifying

D. Granting Attendance –

If the fingerprint is recognized, the attendance granting process starts. The unique ID number of the student is recognized, and he/she is marked present. The attendance data is stored in the form of text file in the memory card. After the attendance is granted, the system can then be passed on to another student.

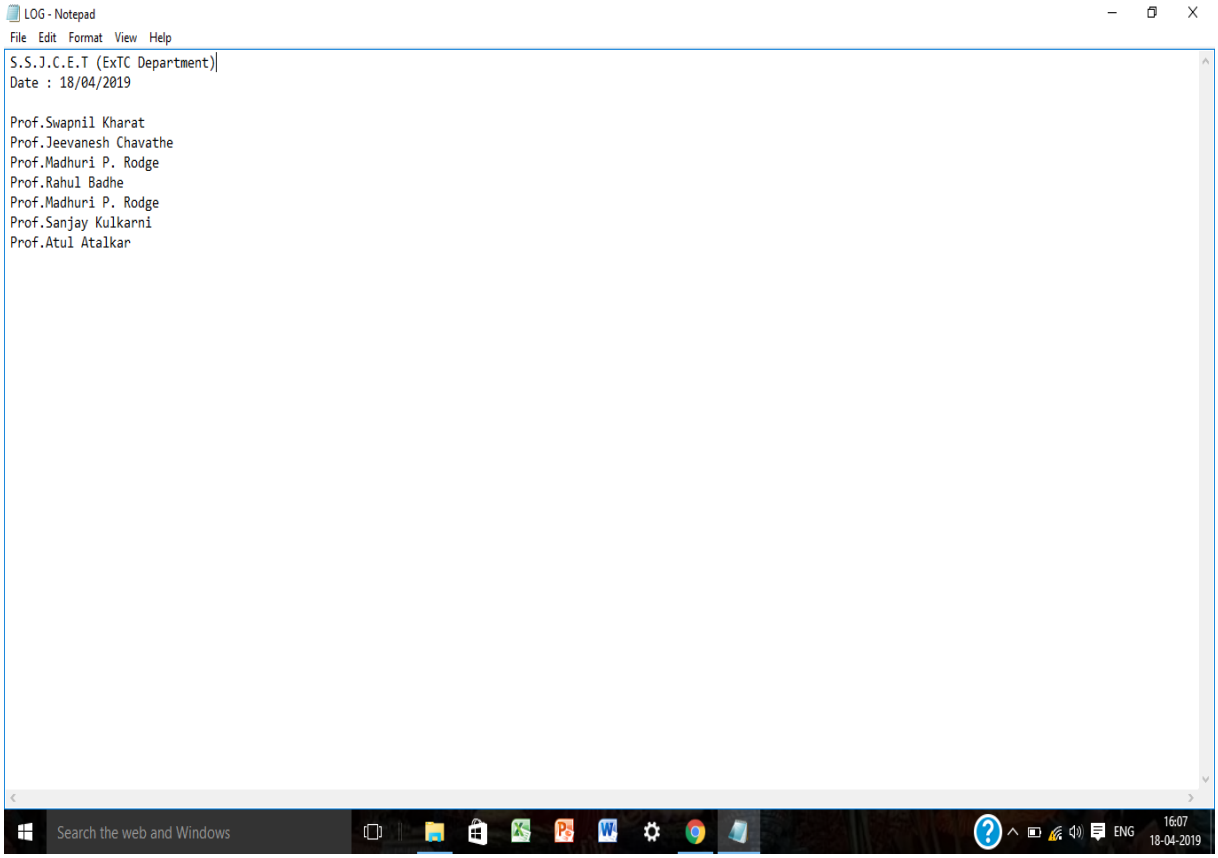

Fig. 5 Attendance data in text file

VI. RESULT

The traditional process of manually taking and maintaining person attendance is highly inefficient and time consuming. The attendance monitoring system based on biometric authentication has a potential to streamline the whole process. An Internet of Things (IoT) based portable biometric attendance system can prove to be of great value to educational institutions in this regard as it proves to be highly efficient and secure. The cost involved in making this system is quite less, when compared to conventional biometric attendance system. The use of fingerprint scanner ensures the reliability of the attendance record. The system, due to its lack of complexity, proves to be easy to use and user friendly.

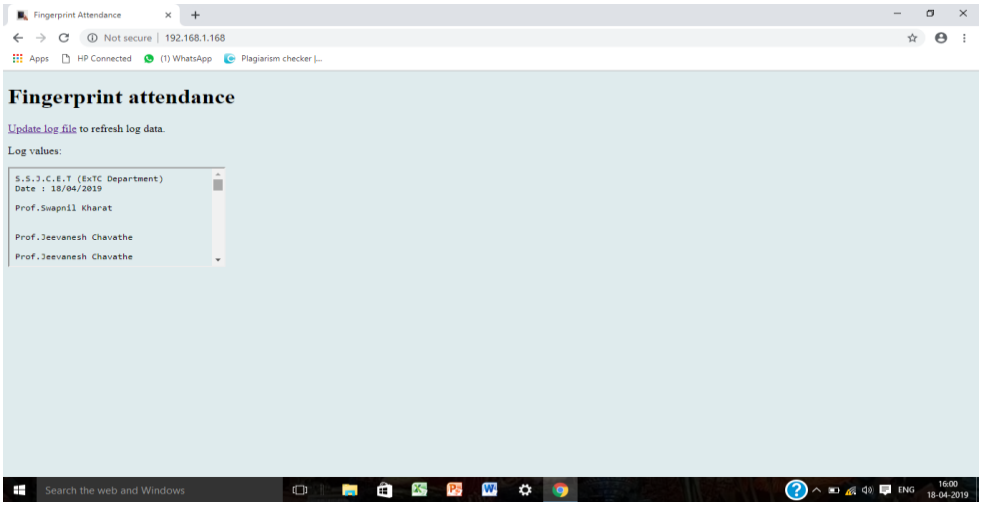

Fig. 6 Final output

VII. CONCLUSION

As the IoT based bio-metric technology evolves, more sophisticated applications will use the capability of IoT based bio-metric to receive, store and forward data to a remote sink source. IoT based bio-metric has many applications as can be imagined. We will utilize the versatility of IoT based biometric in implementing functional and automatic student course attendance recording system that allows students to simply fill their attendance just by pressing their thumb over a fingerprint module and most importantly it will not be time taking as the device is portable. We hope that this system can shift the paradigm of students lecture attendance monitoring in face to face classroom and provide a new, accurate, and less cumbersome way of taking student attendance in educational institutions.

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