IJMRT: Volume (3), Issue 4, 2021

ISSN (Print) : 2663-2381
ISSN(Online) : 2663-4007

International Journal of Multidisciplinary Research Transactions

(A Peer Reviewed Journal)

www.ijmrt.in

Automated Student Attendance System using Fingerprint Recognition

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Abstract

In industrial and domestic applications attendance registering is important at each and every moment. Many face a lot of problems due to lack of proper attendance monitoring system. In this project we use Fingerprint Sensor (JM-101) which senses the Fingerprint of a particular person; Then the fingerprint is stored in cloud with id no. Many people can store their fingerprints. Then next time any person puts their finger on the sensor it checks there are any matching fingerprints or not. In this model, all the fingerprints are stored each and every time someone places his finger. User can connect the system wirelessly with the cloud and monitor the process. 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 project we are going to design Fingerprint Sensor Based Biometric Attendance System using Node MCU. Attendance systems are commonly used systems to mark the presence in offices and schools. From manually marking the attendance in attendance registers to using high-tech applications and biometric systems, these systems have improved significantly. This project has a wide application in school, college, business organization, offices where marking of attendance required accurately with time. By using the fingerprint sensor, the system will become more secure for the users.

Keywords: Finger print, IoT, Biometric system, Attendance monitoring system.

1. Introduction

In the World of Technology, Biometrics plays an effective role in identifying Human beings. Through this project, you will develop a unique system that can identify students for

attendance purpose using their fingerprints. In this project, we are going to design a Fingerprint Sensor Based Biometric Attendance System using Node MCU. Simply we will be interfacing fingerprint sensor with Node MCU. In this project, we used the fingerprint Module and Node MCU to take and keep attendance data and records.

Biometric Attendance systems are commonly used systems to mark the presence in offices and schools. This project has a wide application in school, college, business organization, offices where marking of attendance is required accurately with time. By using the fingerprint sensor, the system will become more secure for the users. A system that records the attendance making use of biometric scanners and stores them securely over cloud in the form of Google Spreadsheet can help resolve issues. The system consists of a fingerprint scanner which is used for ascertaining a student's identity.

If fingerprint scanned matches with records present in the database, attendance is granted to the student by updating to the Google Spreadsheet. 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. There are two stages of working of these systems 1) Enrolment of fingerprints. 2) Matching of Fingerprints.

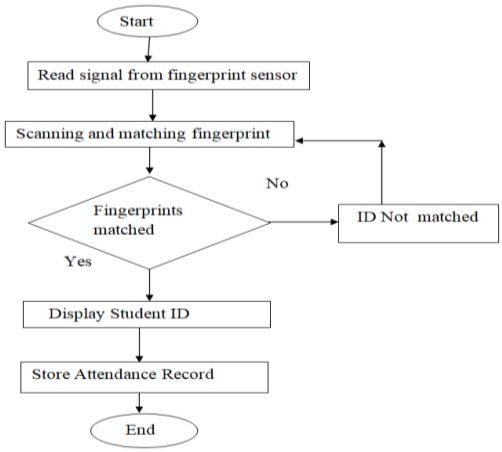

Figure. 1. Working of Fingerprint based Attendance System

1.1 JM-101 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 Node MCU 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.

1.2 Working Principle of Fingerprint Sensor

The skin on the palms of our hands have a special pattern called friction ridges that help us grab things effectively without slipping. These patterns consist of ridges and valleys arranged in certain configurations and is unique for each individual. Our finger tips also have them as you can see from the above image**.** When a finger comes in contact with a surface, the ridges make strong contact with the surface. When we strongly grab something, the moisture, oil, dirt and dead skin cells on our finger can attach to the surface of the material, leaving an impression we call a fingerprint. Various forensic methods involving the use chemicals are used to extract such fingerprints from crime scenes and are called latent fingerprints. But an optical fingerprint scanner works a bit differently.

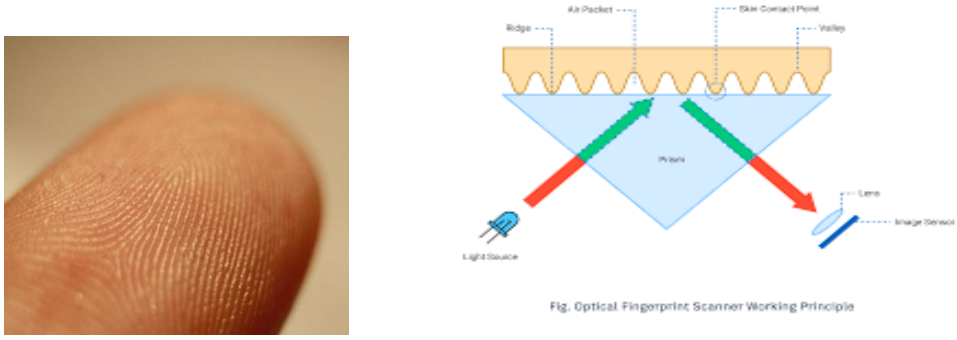

Figure. 2. Fingerprint capture technique

An optical fingerprint scanner works based on the principle of Total Internal Reflection (TIR). In an optical fingerprint scanner, a glass prism is used to facilitate TIR. Light from an LED (usually blue color) is allowed to enter through one face of the prism at a certain angle for the TIR to occur. The reflected light exits the prism through the other face where a lens and an image sensor or the camera or reflector inside it (essentially camera) are placed.

1.3 Preparing the ESP8266-01

The ESP8266 should be operated both in AT command mode and Programming mode for this project. We can use a LM317 to regulate 3.3V for powering the ESP8266 module and connect the Tx Rx pins to FTDI board. The toggle switch can be used to toggle the ESP8266 between AT command mode and Programming mode and push button can be pressed to reset the module. Note that the ESP8266 has to be reset every time before a code is being uploaded to it. If you are confused on how to do it you can refer to the basics of ESP8266, including how to use ESP8266 in AT command mode and Flash firmware on it. This circuit will only be used to upload the program to ESP8266, later we will replace the FTDI board with Node MCU in our final setup.

2. Logic & Operation

2.1 Introduction

After assembling the system, what remains is to observe its operation and efficiency of the system. The total system is divided in several sub systems, like

1. JM-101 interfacing
2. connect to Breadboard

The operation of the whole circuit is depending on every sections performance

2.2 Block Diagram

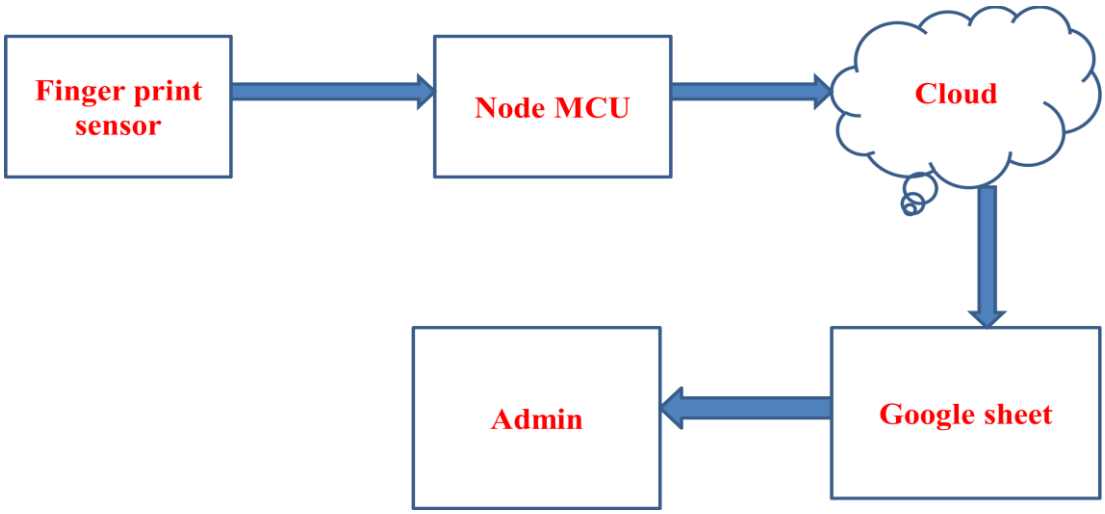

Figure.3. Block Diagram

3.3 PRINCIPLE & OPERATIONS

Few years back if you were to tell someone that the Geyser and bedroom lights in your home are connected to internet, they would be baffled and might even criticize it as over-engineered products. But today with the advent of IoT, Smart cities etc the idea no longer sounds strange, we have devices around us that have become smarter by being able to communicate with the internet.In this project our aim is to leverage this IoT into the boring attendance system to make it smart and more effective. And have to be connected to software via a computer to access the information. Here, we will build a biometric attendance system using Node MCU that scans for finger print and on successful identification of the person it will log the information to a cloud platform like by using the ESP8266 Wi-Fi module. This information can then be displayed in the dashboard of making it available for the required authorities to view and analysis information over the internet without having any direct physical access to the hardware. However the conventional Attendance system without involving IoT can also be built by following the link and Finger print sensor can be further used for many other biometric applications like Voting Machine, Security system etc.

2.6 Coding Logic

The fingerprint attendance system code for arduino is given in the subsequent sections. Although the code is explained well with comments, we are discussing here few important parts of the code. We used fingerprint library for interfacing finger print module with Node MCU board. After it, waiting for the finger print to take input and compare captured image ID with stored IDs. If a match occurs then proceed with next step.And checking enrol/del keys as well Given Function is used to taking finger print image and convert them into the template and save as well by selected ID into the finger print module memory.

2.7 Datasheet from Serial Monitor

Using the Adafruit Fingerprint Sensor library, we add the library for the fingerprint sensor to sense different patterns of fingerprint onto the arduino unit for checking and enrolment is done.We use the serial monitor to check different patterns of fingerprint and different login and biometric usage for different IDs and hence the serial monitor gives us the different login time for different fingerprint patterns.

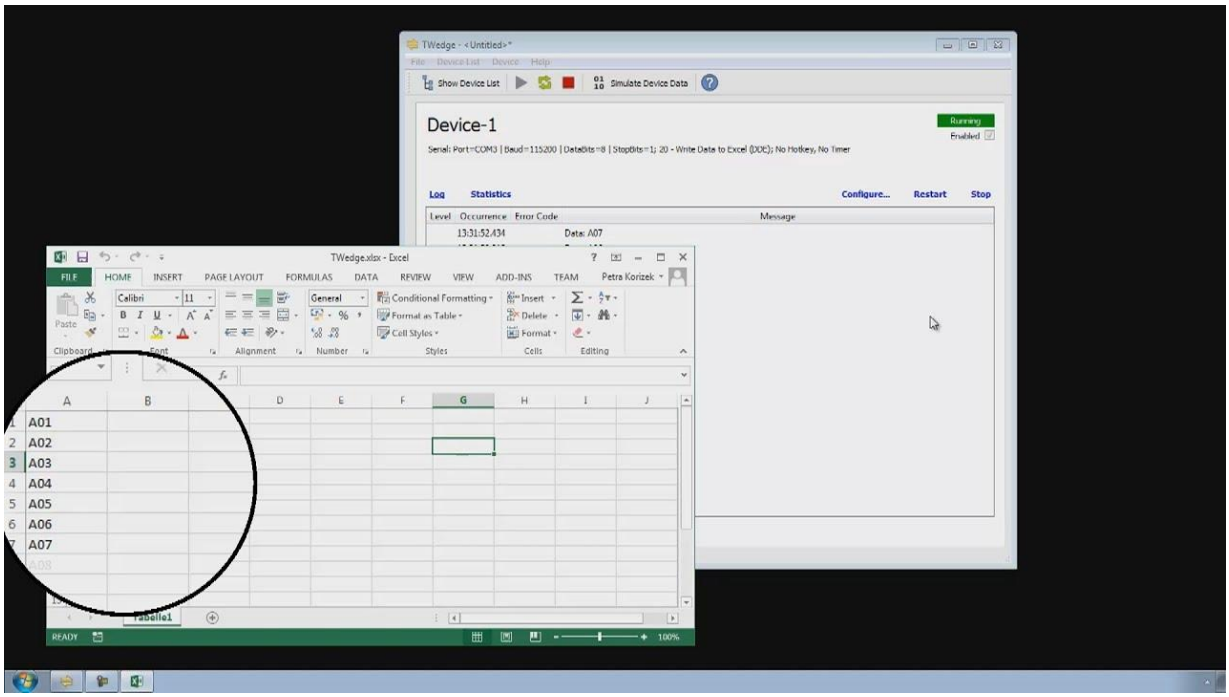

Figure.4. Data sheet of collected data on Arduino Serial Monitor

3. Conclusion & Future Scope

3.1 Conclusion

Here we have developed a Biometric fingerprint based attendance system using Node MCU. In this project we have used jm-101 fingerprint sensor which reads the Fingerprint and stores in the form of digital data. Working of this fingerprint attendance system project is fairly simple. ID for the fingerprint to save it in memory by ID name. So now user needs to enter ID by using UP/DOWN keys. After selecting ID, user needs to press OK key (DEL key). Now user needs to place his finger over fingerprint module and then the module takes finger image. Now user needs to put his finger again and module takes an image and convert it into templates and stores it by selected ID into the finger print module's memory. Now the user will be registered and he/she can feed attendance by putting their finger over fingerprint module. By the same method, all the users will be registered into the system. The use of cloud computing to store the attendance records makes all the data easy to access and retrieve as end when required by the teachers. 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.The system can be improved by encasing it in a plastic covering. This would make it more compact and easy to use in a classroom setting.

The system can be configured to enable lecture wise attendance taking. It can further be improved to automatically calculate attendance percentages of students and intimate the teachers if a student's attendance is below a certain percentage.

3.2 Results

The experimental model was made following the circuit diagram and the desired results were obtained. Every time someone places his finger on the sensor the sensor reads the data and stores it in the cloud. Next time someone wants to check the fingerprint he/she places the finger on the sensor. The sensor reads the data and searches and cross-checks the data with stored fingerprints. If it matches with any of them then it displays the username, date and time. If not then says fingerprint doesn't match. That's how the whole system works.

3.3 Scope for Future

Biometric attendance system using Node MCU is very useful for many industries and offices. It's easy, cost effective and works very well. Hence the future scope of this technology is wide spread and quite essential in both domestic and Industrial applications.

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