**JNAN CHANDRA GHOSH POLYTECHNIC**

**Department of Electronics and Telecommunication Engineering.**

# Program: Diploma in Electronics and Telecommunication Engineering

Session 2022-23 Semster-6

**Project Report on**

**-BIOMETRIC ATTENDANCE SYSTEM-Project Execution Phase**

# Report Submitted by

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# Under Guidance of Jitpal Roy, Lecturer in ETCE, JCG

**Declaration**

We hereby declare that we are submitting our project work report on Biometric Attendance System for Semester-6. We have done the literature survey and plan as per the prescribed syllabus of WBSCTVESD for the session 2022-23.

Date:31/7/2023

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**INTRODUCTION:**

This 21st Century organization faced so many wicked problems. Because of that organization following manual system. They also immediately need to exchange an efficient and effective system by developing one type of the system. This research study was providing a solution to solve these problems in an effective manner. In the current era, the development of the Bio-Metrics Based Systems was very important. Organizations want to develop own management information systems. It was important to different requirements, perception, judgment, and human intelligence. This Bio-Metrics Based Student Management System provides more use full information that helps decisions making opportunities, providing the answers and set of queries. Because the organization has so many burdens of monitoring and maintaining the achievement of individual students. Educational organizations to ease this burden are affected by the organization's access to student’s information which has to be accurate and relevant. It has many benefits for the well-designed student’s records fields.

In the era, reliable and secure user authentication is a more important need and most commonly used for user authentication biometric System. Bio-Metrics Based Student Management System deals with all kind of information such as individual student details, student academic reports, institution details, course details and other resource-related details. Applying biometrics to user authentication was to provide security and physiological terms of users for an examples voice, fingerprint, iris, and face and keystroke. It is the highly secure identification and personal solution for becoming the foundation and personal verification solutions. It has the potential to offer much more than a traditional system for an example passwords or passcodes pins tokens.

System owners and end users use this Bio-Metrics Based Student Management System, provide accurately required. This system has data’s, databases and tables. The purpose of this system is to provide an efficient and effective system. Manually and used Papers based media to store and process their operations. Many of our sections were not near, therefore it faces difficulties handling, and some of the documents are maintained redundancy.

Theoretical Approach of Bio-Metrics Based Student Management System effectively handles the above details through this system, the user (students) can submit their Inquiries and then the Administrator can also manage the effectively And also the Administrator can handle the admission processes, manage the registered students’ details, handle the class locations, class times & teachers’ schedules, and feedback the students easily.

**LITERATURE SURVEY:**

**IDEA:**

The source of our idea was from schools colleges and other offices we have been to , where there attendance is still taken manually and which is time consuming inefficient and wastage of paper .So we wanted to make something that would solve this and the answer to it was a Biometric Fingerprint Attendance system.

**Websites & References: -**

Based on our idea for the project we started off by searching for biometric fingerprint attendance system on google as we had no prior knowledge about it. After googling about it we found a list of websites and got very basic understanding on how this system works. First we got the gist of it and read about it’s implications and how it works. The article that we read it from is from this link Published by Jobit Joseph June1,2022 <https://www.researchgate.net/publication/269962935_Biometric_Attendance_System>

* Then we starts to learn how we can do the project an affordable price from, <https://circuitdigest.com/microcontroller-projects/biometric-attendance-system-with-google-sheets>. But we did not have any prior knowledge about DBMS so this was not a feasible idea as none of the members of our group had any prior knowledge about DBMS. Another problem that we encountered with this is that it required a separate timer. Least to say it would have been an arduous task. So we looked at other links and tried to gather more on this project.
* We have to now learn about ESP 32 module for which we took our help from this youtube video <https://youtu.be/xPlN_Tk3VLQ>
* Also for fingerprint sensor, we had to have knowledge which we took from <https://www.youtube.com/watch?v=6rK-PJJdtX4&pp=ygUEcjMwNw%3D%3D>
* After searching on an alternative for DBMS , we found IFTTT which will allow us to skip the DBMS part, as it has it’s own database. To figure out how to work with an IFTTT , we found out this video from Youtube <https://youtu.be/YkA4TUgCmRA> which helped us in getting a brief overview on IFTTT. We also learned about the coding part of IFTTT from this Github repository<https://github.com/stechiez/iot_projects/tree/master/GoogleSpreadSheet_ESP32_IFTTT>
* Now we had to learn about how to learn about enrolling a fingerprint using Arduino IDE. This is the link from which we understood this. [https://minov.in/how-to-setup-fingerprint-sensor-with-arduino](https://minov.in/how-to-setup-fingerprint-sensor-with-arduino/)
* Now we have started to get a brief overview of how our project might shape up to be. For implementing all of the different components that we learned about individually and making them work together as a unit ,we took help from this link with regards to the implementation process <https://www.researchgate.net/publication/269962935_Biometric_Attendance_System> and for the coding part of it we took help from this Github repository <https://github.com/techiesms/IoT-Attendance-System->
* We have come a long way from not knowing anything apart from our idea to getting this far, the only thing remaining is OLED displays and buzzer which we had decided to implant in our project. So that it looks much better along with being easier to work with. With regards to the OLED displays we got our information from <https://dronebotworkshop.com/oled-ard>.
* When it comes to Buzzer it was quite simple so we managed to do it on our own.
* Finally we merge all of these individual components and our final Project is ready and successfully completed.

**THEORITICAL BACKGROUND:**

**1.IMPORTANCE OF FINGERPRINT BIOMETRICS** Fingerprints were considered to be the best and fastest method for biometric identification. It was most high security for the student’s attendance. Students do not make fake attendance & must use to finger. They are secure to use and unique for every person. It has been proven over the years, through research that no two individuals have the same fingerprint . Fingerprints have been used as a means to identify a person for a long time. Each fingerprint is made up of a pattern of ridges and valley on the surface of a fingertip. Finger ridge configurations do not change throughout the life of an individual except due to accidents such as bruises, cuts on the fingertips or deliberately damaging the fingers. When compared with other biometrics.

**2.OBJECTIVES OF THE RESEARCH** The purpose of this research to provide an efficient and effective Bio-Metrics Based Student Management System Handle Inquiries to each courses, and manage the details of the teachers and students, handling the course payments progress, manage the class and teachers’ schedules, maintenance, releasing result of the students, generating reports and preparing summary details of the students. S SRIKAJAN et al.: A THEORETICAL APPROACH OF BIOMETRICS BASED STUDENT MANAGEMENT 1802 The Managing Director and Administrators are faced Difficulties in preparing a summary, details for inquiries to each course, manage students and teachers’ details, scheduling the class location, class time and lecture schedules and preparing payment summaries, pay sheets. Presently, all the administration works are handled manually and use papers based media to store and process their operations. Most of the department and Lecture Halls are not located close by. It faces difficulties handling, (duplicated) redundancy works was all areas Therefore BioMetrics Based Student Management System help to overcome the difficulties . Through this system, the user (students) can submit On-Line inquiries and then the Administrator can also manage the On-Line inquiries effectively. And also the administrator can handle the admission processes, manage the registered students’ details, handling the class locations, class time & teachers’ schedules, and feedback of the student easily. We are using C#.net to design data gathering system. So that, all the necessary details of the BioMetrics Based Student Management System will be stored in the database. Literature, there were many characteristics discussed for an effective Bio-Metrics Based Student Management System . Advantage of Bio-Metrics Based Student Management System • High security - Using Bio-Metrics method was high-security power.

• On Time and Time Saving - Using Computers can save a lot time. This was possible, as computers were fast and more accurate as compared to human beings.

• Economical - Due to computerization, more accurate functioning can be obtained as compared to manual systems in long-term.

• Easy and faster Data Retrieval - By using computerized system data can be retrieved at much faster pace. Old records can be located immediately and easily

• Much more details Available - a lot of details can be obtained easily in a computerized system which otherwise cannot be available in a manual system.

**3.EXISTING SYSTEM** In early-stage maintaining the student’s management activities consists of student enrolments, Administration, maintenance, examination, student attendance and issuing Certificate procedures that are handled manually. In these system, people do all the processing manually. All the calculation also should be done manually and data and information written in papers should be stored in files in envelops that are kept in lockers [7]. It needs updating manually. The main disadvantage of this procedure takes additional time and effort. Further it is difficult to retrieve information quickly, prone error, Reduction in customer service, lack of security, duplicate of data entry time consuming, manpower, high workforce prone error damage, by mistake, by misspelling, missing, duplicate of data entry. In addition, need a lot of manpower for maintenance [8].

**4.PROPOSED SYSTEM** The proposed Bio-Metrics Based Student Management System is accuracy, provide high security and increase safety. This Bio-Metrics Based Student Management System has many advantages. The system is capable of converting the collected data from the routine use and machine interactions into the effective information which was later on used by the decision makers to make appropriate decisions. In the Bio-Metrics Based Student Management System, the most important entity system itself which has a set of defined and interrelated components which are generally described as all of the direct or indirect complex components or elements that are related in a causal network. Within any particular time period, all of these complex components are interrelated in more or less stable way with at least some other components so a well-developed and interactive system was one which provides best and useful information to the managers at all levels [9]. These were perfective Maintenance where new functionality is added to system adaptive maintenance where the system was adapted to new environments and corrective maintenance which is systems repair. And we’ll add fingerprint attendance system. The finger was a very high-level security. Every person has a variety of fingertips so we easily found the persons and don’t make fake attendance. Because every person has different fingertips. So we would make to high-level security [10]. The system is to developed is support daily operations of student management system by improving various processes such as,

• Student Registration

• Search Courses, time tales

• Report generate result

• Search Modules

**HARDWARE DETAILS :**

**ESP 32:**

ESP 32-Microcontroller with built-in WIFI and Bluetooth. ESP32 can work with a clock frequency up to 240MHz and has a RAM of 521kB. The ESP-WROOM-32 module is also equipped with an SPI flash storage of 4MB, which can be used for the application area as well as the file system. Here are the specifications of the ESP-WROOM-32 Development Kit.

**Processors**

CPU: Xtensa dual-core

(or single-core) 32-bit LX6 microprocessor, operating at 160 or 240 MHz and performing at up to 600 DMIPS

· Ultra low power (ULP) co-processor

**Memory:**

· 320 KiB RAM, 448 KiB ROM

**Wireless connectivity:**

· Wi-Fi: 802.11 b/g/n

· Bluetooth: v4.2 BR/EDR and BLE (shares the radio with Wi-Fi)

**Peripheral interfaces:**

· 34 × programmable GPIOs

· 12-bit SAR ADC up to 18 channels

· 2 × 8-bit DACs

· 10 × touch sensors (capacitive sensing GPIOs)

· 4 × SPI

· 2 × I²C interfaces

· 3 × UART

· SD/SDIO/CE-ATA/MMC/eMMC host controller

· SDIO/SPI slave controller

· Ethernet MAC interface with dedicated DMA and planned IEEE 1588 Precision Time Protocol support.

· CAN bus 2.0

· Infrared remote controller (TX/RX, up to 8 channels)

· Motor PWM

· LED PWM (up to 16 channels)

· Hall effect sensor

· Ultra-low power analog pre-amplifier

**Security:**

· IEEE 802.11 standard security features all supported, including WPA, WPA2, WPA3 (depending on version)[5] and WLAN Authentication and Privacy Infrastructure (WAPI)

· Secure boot

· Flash encryption

· 1024-bit OTP, up to 768-bit for customers

· Cryptographic hardware acceleration: AES, SHA-2, RSA, elliptic curve cryptography (ECC), random number generator (RNG)

**Power management:**

· Internal low-dropout regulator

· Individual power domain for RTC

· 5 μA deep sleep current

· Wake up from GPIO interrupt, timer, ADC measurements, capacitive touch sensor



**FINGERPRINT SENSOR MODULE:**

Fingerprints are one of the unique ways to identify an individual. There are multiple types of fingerprint sensors available in the market. The main categorization is based on how they acquire the fingerprint data. Optical fingerprint Sensors are capacitive fingerprint sensors. Capacitive Fingerprint Sensor.

changes, which can then be recorded by an analog-to-digital converter. Once captured, this digital data is analyzed to look for distinctive and unique fingerprint attributes.

In this project we will be using R307 Fingerprint sensor Module

R307 Fingerprint sensor Module- In this project, we have used such a sensor, the popular R307 Optical Fingerprint Sensor. They are manufactured by Hangzhou Grow Technology Co., Ltd. The R307 module operates at a voltage of 4.2V~6V and 50 mA with a storage capacity of 1000 impressions. R307 has both UART and USB 2.0 interfaces to communicate with a computer system at a baud rate in multiples of 9600 BPS. It is capable of both 1:1 and 1:N matching with FAR (False Acceptance Rate) less than 0.001 %. The module can scan a live finger in less than

0.5 seconds and supports five security levels (1~5; 5 is the highest). The operating temperature range of this sensor is -10˚C to 40˚C, making it deployable in most of the locations.

R307 has a glass top where a fingertip can be placed for scanning. Below the glass top is placed a prism. The inside of the sensor is divided into two parts using a light barrier. On one side of the light barrier is a PCB consisting of four blue LED lights. On the other side of the light barrier is an image sensor connected to a processor.

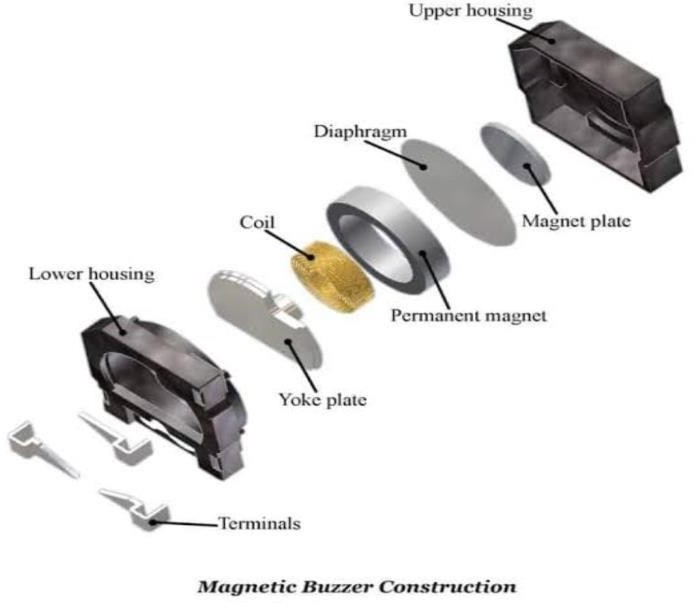
PINOUT FOR R307 FINGERPRINT SENSOR:

|  |  |  |
| --- | --- | --- |
| PIN NO. | NAME | DESCRIPTION |
| 1 | VCC | Positive Supply (VCC) |
| 2 | GND | Supply Ground (GND) |
| 3 | TXD | UART TX |
| 4 | RXD | UART RX |
| 5 | TOUCH | Finger Detection Signal |
| 6 | 3.3V | Finger Detection Power |

**BUZZER:**

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarms, music, bell & siren.

The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the ‘+’ symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the ‘-‘symbol or short terminal and it is connected to the GND terminal.



## Specifications

* The specifications of the buzzer include the following.
* Color is black
* The frequency range is 3,300Hz
* Operating Temperature ranges from – 20° C to +60°C
* Operating voltage ranges from 3V to 24V DC
* The sound pressure level is 85dBA or 10cm
* The supply current is below 15mA

**OLED DISPLAY:**

OLED (Organic Light-Emitting Diode) is a self light-emitting technology composed of a thin, multi-layered organic film placed between an anode and cathode. In contrast to LCD technology, OLED does not require a backlight. OLED possesses high application potential for virtually all types of displays and is regarded as the ultimate technology for the next generation of flat-panel display

This 2.44 cm (0.96 Inch) I2C/IIC 4pin OLED Display Module BLUE can be interfaced with any microcontroller using SPI/IIC/I2C protocols. It is having a resolution of 128x64. The package includes display board, display, 4 pin male header pre-soldered to board.

OLED monochrome 128x64 dot matrix display module. The characteristics of this display module are high brightness, self-emission, high contrast ratio, slim/thin outline, wide viewing angle, wide temperature range and low power consumption.

#### Interface pin for 4 PIN 128x64 OLED

1. **VCC**: 3.3 volts 5 Volts
2. **GND**: Ground
3. **SCL**: Serial Clock
4. **SDA**: Serial Data

## Features:

1. Super High Brightness (Adjustable)
2. Super High Contrast (Adjustable)
3. Embedded Driver/Controller
4. Display size: 2.44 cm (0.96 Inch)
5. Resolution radio:128 x 64
6. Interface modes: I2C/IIC
7. working voltage: 3.3V
8. Control Chip: SSD1306

#### Package Includes:

1 x 2.44 cm (0.96 Inch) I2C/IIC 128x64 4pin OLED Display Module - Blue Color

## Specifications:

|  |  |
| --- | --- |
| Display Size | 2.44 cm (0.96 inch) |
| Pixel Color | Blue |
| Resolution | 128 x 64 Pixels |
| Driving Voltage | 3.3-5V |
| Operating Temperature | B6 Celsius |
| Interface Type | I2C IIC |
| Length (cm) | 2.75 cm |
| Width (cm) | 2.75 cm |
| Height (cm) | 1.1 cm |
| Weight (gm) | 7 gm |



**IFTTT:**

What is IFTTT?

IFTTT is short for If This Then That, and is the best way to integrate apps, devices, and services. We help devices, services, and apps work together in new and powerful ways.IFTTT was founded on the belief that everything works better together. Tech incompatibility has become challenging for anyone trying to build a smart home or create automatic routines in their life. IFTTT makes it easy.

What can IFTTT do?

Some of our most popular smart home Applets include using the weather to determine the temperature in home, turning on your security system when leaving home, and using voice to turn on a device. The most common social media Applets help cross-post content automatically and streamline your online strategy.

we can create your own Applets or enable published Applets by clicking on them. There are [Pro and Pro+ features like filter code, queries, and multi-actions](https://ifttt.com/subscriptions/pro).

Automating is as easy as...

Each service has a combination of triggers and actions that can be combined to create the automation that helps you achieve your goals, be more efficient, and improve your smart home.

1. Choose the trigger2.
2. Choose the action
3. 3. Name the Applet and hit Fi

**CIRCUIT DIAGRAM AND INSTALLETION:**

3.3 volt connection for fingerprint and OLED display vcc

Ground connection for OLED, FINGERPRINT and BUZZER ground

Pin no d18 for buzzer supply

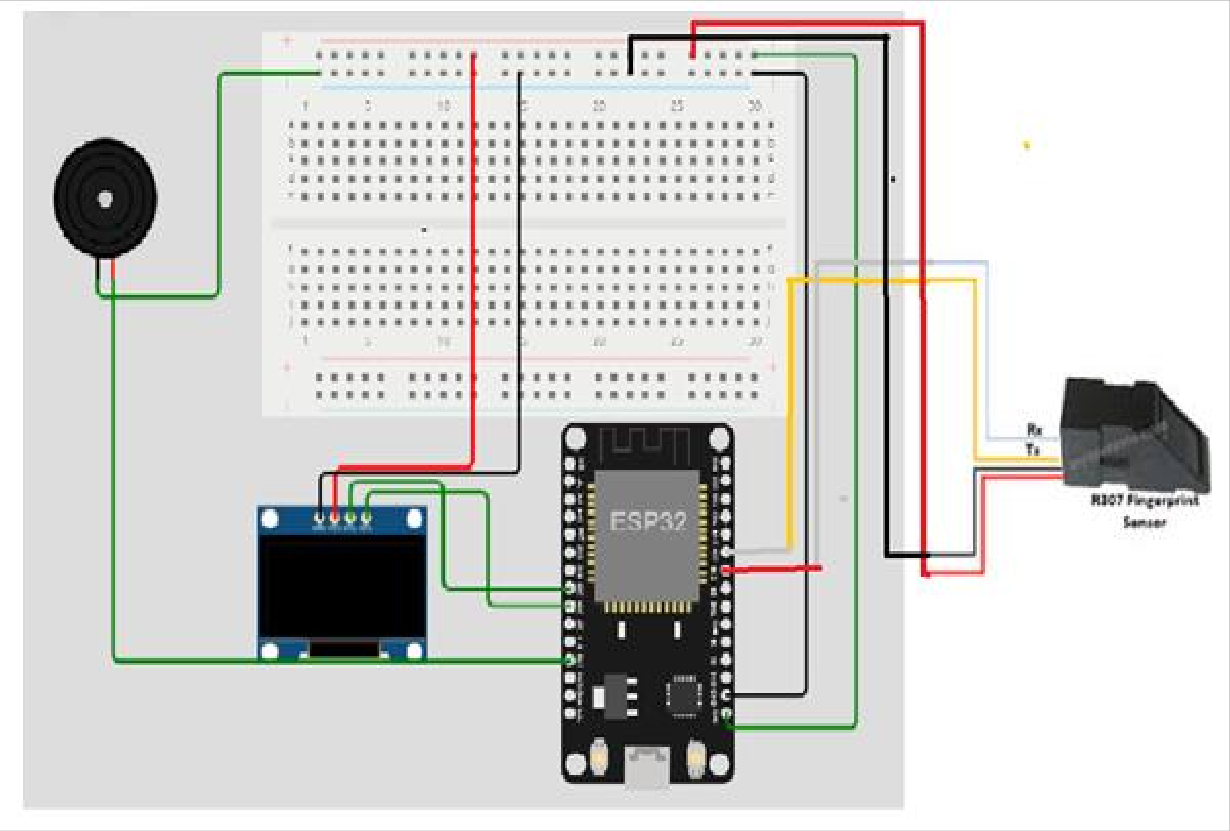
Gpio 21 of esp connected with OLED SDA

Gpio 22 of esp connected with OLED SCL

Fingerprint rx2 with esp tx2

Fingerprint tx2 with esp rx2

We connect a power bank for power supply with esp 32 with a usb 2 to usb B cable.



**SOFTWARE DETAILS:**

We got our main code from here Github repository <https://github.com/techiesms/IoT-Attendance-System-> we also change the the program to take 3 different values. And we also added the programs for buzzer and oled display.

**SKETCH:**

#include <Adafruit\_Fingerprint.h>  // fingerprint sensor library

#include <HardwareSerial.h>         // for esp 32

#include <WiFi.h>            // for wifi connection

#include <Wire.h>           // for oled connection i2c

#include <Adafruit\_GFX.h>   // for oled display

#include <Adafruit\_SSD1306.h>  // for oled display

#include <SPI.h>      // for oled connection sp

#define SCREEN\_WIDTH 128  // screen height and width of oled

#define SCREEN\_HEIGHT 32

#define OLED\_RESET     -1

#define SCREEN\_ADDRESS 0x3C

Adafruit\_SSD1306 display(SCREEN\_WIDTH, SCREEN\_HEIGHT, &Wire, OLED\_RESET);

const char\* NAME;     // 3 columns are created for name ,registration and roll number

const char\* ID;

const char\* rollno;

int buzz=18;        //buzzer pin 18

String Event\_Name = "fingerprint";     // event name in webhook

String Key = "j61K9MUrfwDx6DnCXvsHCd85cA1z5ovEub7YjZm3R\_i";     // unique string key different for every user

// Replace with your unique IFTTT URL resource

String resource = "/trigger/" + Event Name + "/with/key/" + Key;

// Maker Webhooks IFTTT

const char\* server = "maker.ifttt.com";                  // website name

// Replace with your SSID and Password

const char\* ssid     = "Wifi M12";       // this WIFI name and password is given from srinjoy Chakraborty’s smart phone

const char\* password = "galaxym12";

Adafruit\_Fingerprint finger = Adafruit\_Fingerprint(&Serial2);

void setup()

{

   pinMode(buzz,OUTPUT);

  Serial.begin(115200);

  Serial2.begin(115200);

  while (!Serial);  // For Yun/Leo/Micro/Zero/...

  delay(100);

  Serial.println("\n\nAdafruit finger detect test");

   if(!display.begin(SSD1306\_SWITCHCAPVCC, SCREEN\_ADDRESS)) {

    Serial.println(F("SSD1306 allocation failed"));

    for(;;);

  }

  // set the data rate for the sensor serial port

  finger.begin(57600);

  delay(5);

  if (finger.verifyPassword()) {

    Serial.println("Found fingerprint sensor!");

  } else {

    Serial.println("Did not find fingerprint sensor :(");

    while (1) {

      delay(1);

Serial.print(ssid);

  WiFi.begin(ssid, password);

  int timeout = 10 \* 4; // 10 seconds

  while (WiFi.status() != WL\_CONNECTED  && (timeout-- > 0)) {

    delay(250);

    Serial.print(".");

  }

  Serial.println("");

  if (WiFi.status() != WL\_CONNECTED) {

    Serial.println("Failed to connect, going back to sleep");

  }

  Serial.print("WiFi connected in: ");

  Serial.print(millis());

  Serial.print(", IP address: ");

  Serial.println(WiFi.localIP())

   display.display();

   display.setTextSize(1);

    display.setTextColor(WHITE);

  display.clearDisplay();

  display.setCursor(0,0);

  display.println("WiFi connected in: "); //when WIFI get connected oled display show "wifi connected in"

  display.println(", IP address: ");//                                               "ip adress:xxxx.xxxx.xxxx.xxxx"

  display.println(WiFi.localIP());

  display.display();

  delay(5000);                         // it will show for 5 sec after that screen will blank

  display.clearDisplay();

  display.display();

}

void buzzer()

{

digitalWrite(buzz,HIGH);      // when attendance will marked buzzer will make a noise for 1sec

delay(1000);

digitalWrite(buzz,LOW);

delay(1000);

}

void loop()                     // run over and over again

{

  getFingerprintIDez();

  if (finger.fingerID == 1) {   // unique id per person aas given in r307 sensor

                              // id 1 for saptarshi mondal

    Serial.print("!!--");

    Serial.println(finger.fingerID);

    NAME = "Saptarshi Mondal";

    ID = "D212223112";

    rollno="DJCGETCES6//10023142";

    if (finger.confidence >= 60) {     // when finger print accuracy is more than

60% attendance will marke

      Serial.print("Attendace Marked for "); Serial.println(NAME);

      makeIFTTTRequest();                 // its for send data into the server

      buzzer();

       display.display();

   display.setTextSize(1);

    display.setTextColor(WHITE);

  display.clearDisplay();

  display.setCursor(0,0);

  display.println("Attendace Marked for ");    // oled display show "Attendence marked for "

  display.println(NAME);                       //                   "name" for 5 sec

   display.display();

   delay(5000);

    display.clearDisplay();                     // after that the screen will clear

     display.display();

    }

  }

  if (finger.fingerID == 2) {    // id 2 for srinjoy chakroborty

    Serial.print("!!--");

    Serial.println(finger.fingerID);

    digitalWrite(2, LOW);

    NAME = "Srinjoy Chakrabarty";

    ID = "D202110097";

    rollno="DJCGETCES6//10010225";

    if (finger.confidence >= 60) {

      Serial.print("Attendace Marked for "); Serial.println(NAME);

      makeIFTTTRequest();

      buzzer();

       display.display();

   display.setTextSize(1);

    display.setTextColor(WHITE);

  display.clearDisplay();

  display.setCursor(0,0);

  display.println("Attendace Marked for ");

  display.println(NAME);

  display.display();

   delay(5000);

    display.clearDisplay();

     display.display();

    }

}

   if (finger.fingerID == 3 ) {    // id 3 for swastik dutta

    Serial.print("!!--");

    Serial.println(finger.fingerID);

    digitalWrite(2, LOW);

    NAME = "Swastik Dutta";

    ID = "D202110103";

    rollno="DJCGETCES6//10010231";

    if (finger.confidence >= 60) {

      Serial.print("Attendace Marked for "); Serial.println(NAME);

      makeIFTTTRequest();

      buzzer();

       display.display();

   display.setTextSize(1);

    display.setTextColor(WHITE);

  display.clearDisplay();

  display.setCursor(0,0);

  display.println("Attendace Marked for ");

  display.println(NAME);

  display.display();

   delay(5000);

    display.clearDisplay();

     display.display();

    }

  }

  if (finger.fingerID == 4 ) {     // id 4 for suman dey

    Serial.print("!!--");

    Serial.println(finger.fingerID);

    digitalWrite(2, LOW);

    NAME = "Sumon Dey";

    ID = "D21212222";

    rollno="DJCGETCES6//10010512";

    if (finger.confidence >= 60) {

      Serial.print("Attendace Marked for "); Serial.println(NAME);

      makeIFTTTRequest();

      buzzer();

       display.display();

   display.setTextSize(1);

    display.setTextColor(WHITE);

  display.clearDisplay();

  display.setCursor(0,0);

  display.println("Attendace Marked for ");

  display.println(NAME);

   display.display();

   delay(5000);

    display.clearDisplay();

     display.display();

    }

  }     //  //don't ned

  finger.fingerID = 0;

}

uint8\_t getFingerprintID() {

  uint8\_t p = finger.getImage();

  switch (p) {

    case FINGERPRINT\_OK:

      Serial.println("Image taken");

      break;

    case FINGERPRINT\_NOFINGER:

      Serial.println("No finger detected");

      return p;

    case FINGERPRINT\_PACKETRECIEVEERR:

      Serial.println("Communication error");

      return p;

    case FINGERPRINT\_IMAGEFAIL:

      Serial.println("Imaging error");

      return p;

    default:

      Serial.println("Unknown error");

      return p;

  }

  // OK success!

  p = finger.image2Tz();

  switch (p) {

    case FINGERPRINT\_OK:

      Serial.println("Image converted");

      break;

    case FINGERPRINT\_IMAGEMESS:

      Serial.println("Image too messy");

      return p;

    case FINGERPRINT\_PACKETRECIEVEERR:

      Serial.println("Communication error");

      return p;

    case FINGERPRINT\_FEATUREFAIL:

      Serial.println("Could not find fingerprint features");

      return p;

    case FINGERPRINT\_INVALIDIMAGE:

      Serial.println("Could not find fingerprint features");

      return p;

    default:

      Serial.println("Unknown error");

      return p;

  }

  // OK converted!

  p = finger.fingerFastSearch();

  if (p == FINGERPRINT\_OK) {

    Serial.println("Found a print match!");

  } else if (p == FINGERPRINT\_PACKETRECIEVEERR) {

    Serial.println("Communication error");

    return p;

  } else if (p == FINGERPRINT\_NOTFOUND) {

    Serial.println("Did not find a match");

    return p;

  } else {

    Serial.println("Unknown error");

    return p;

  }

  // found a match!

  Serial.print("Found ID #"); Serial.print(finger.fingerID);

  Serial.print(" with confidence of "); Serial.println(finger.confidence);

  return finger.fingerID;

}

// returns -1 if failed, otherwise returns ID #

int getFingerprintIDez() {

  uint8\_t p = finger.getImage();

  if (p != FINGERPRINT\_OK)  return -1;

  p = finger.image2Tz();

  if (p != FINGERPRINT\_OK)  return -1;

  p = finger.fingerFastSearch();

  if (p != FINGERPRINT\_OK)  return -1;

  // found a match!

  Serial.print("Found ID #"); Serial.print(finger.fingerID);

  Serial.print(" with confidence of "); Serial.println(finger.confidence);

  return finger.fingerID;

}

// Make an HTTP request to the IFTTT web service

void makeIFTTTRequest() {

  Serial.print("Connecting to ");

  Serial.print(server);

  WiFiClient client;

  int retries = 5;

while (!!!client.connect(server, 80) && (retries-- > 0)) {

    Serial.print(".");

  }

  Serial.println();

  if (!!!client.connected()) {

    Serial.println("Failed to connect...");

  }

  Serial.print("Request resource: ");

  Serial.println(resource);

  String jsonObject = String("{\"value1\":\"") + NAME + "\",\"value2\":\"" + ID + "\",\"value3\":\"" + rollno   + "\"}";     // 3 different value will send in server

  client.println(String("POST ") + resource + " HTTP/1.1");

  client.println(String("Host: ") + server);

  client.println("Connection: close\r\nContent-Type: application/json");

  client.print("Content-Length: ");

  client.println(jsonObject.length());

  client.println();

  client.println(jsonObject);

  int timeout = 5 \* 10; // 5 seconds

  while (!!!client.available() && (timeout-- > 0)) {

    delay(100);

  }

  if (!!!client.available()) {

    Serial.println("No response...");

  }

  while (client.available()) {

    Serial.write(client.read());

  }

  Serial.println("\nclosing connection");

  client.stop();

}

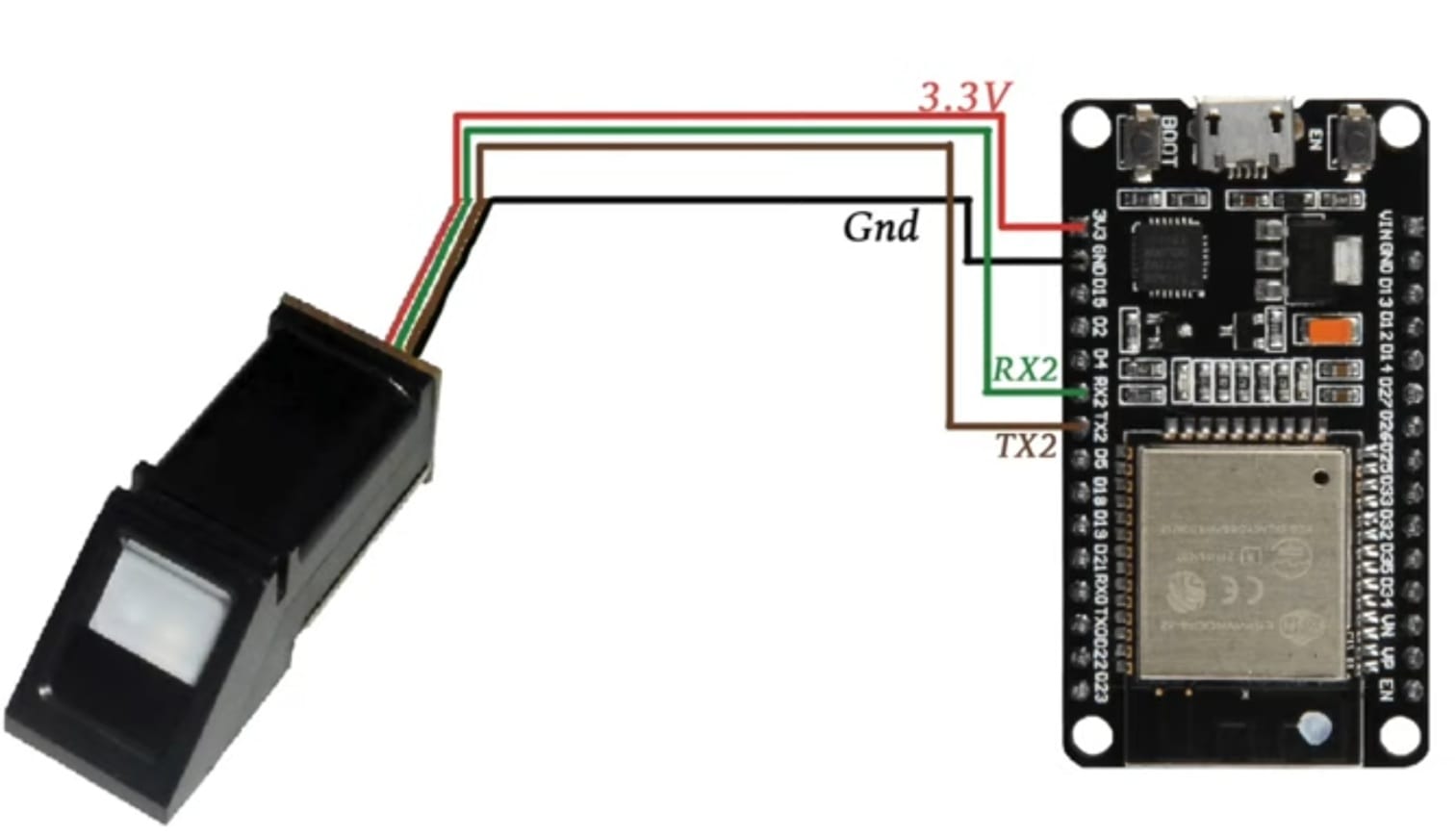
**EXPERIMENTATION:**

**1. Using Arduino to enroll fingerprint:** (12/06 /23)

**Experimental details**: First we have to look fingerprint r307 sensor is working o not . First we download adafruit fingerprint sensor libnrary from library manager.

Then we try to run enrollment program from examples sketch .We connect the fingerprint sensor with Arduino uno as written in the program.(pin 2,3 of Arduino with rx and tx of fingerprint ) . and try to enroll our fingerprint in the order

|  |  |
| --- | --- |
| ID | NAME |
| 1 | Saptarshi Mondal |
| 2 | Srinjoy Chakroborty |
| 3 | Swastik Dutta |
| 4 | Sumon Dey |



**Result**: We successfully manage to enroll our fingerprints. We R307 starts blink with a blue light means. Its actually working. We have to check serial monitor for commands. first, we have to write or id and enter our fingerprint in this manner.

We have to follow same id for our main program.

**Conclusion;** enrollment fingerprint of our group participant is successful done. R307 sensor can store only 128 different data that’s a limitation. Now when students/ we enter our finger on fingerprint module it will sense the data and send a affirmative response when fingerprint accuracy is more than 60%.

**2. initialization of esp 32 :**  (16/06 /23)

**Experimental details**: First we have to write this link for additional board manager

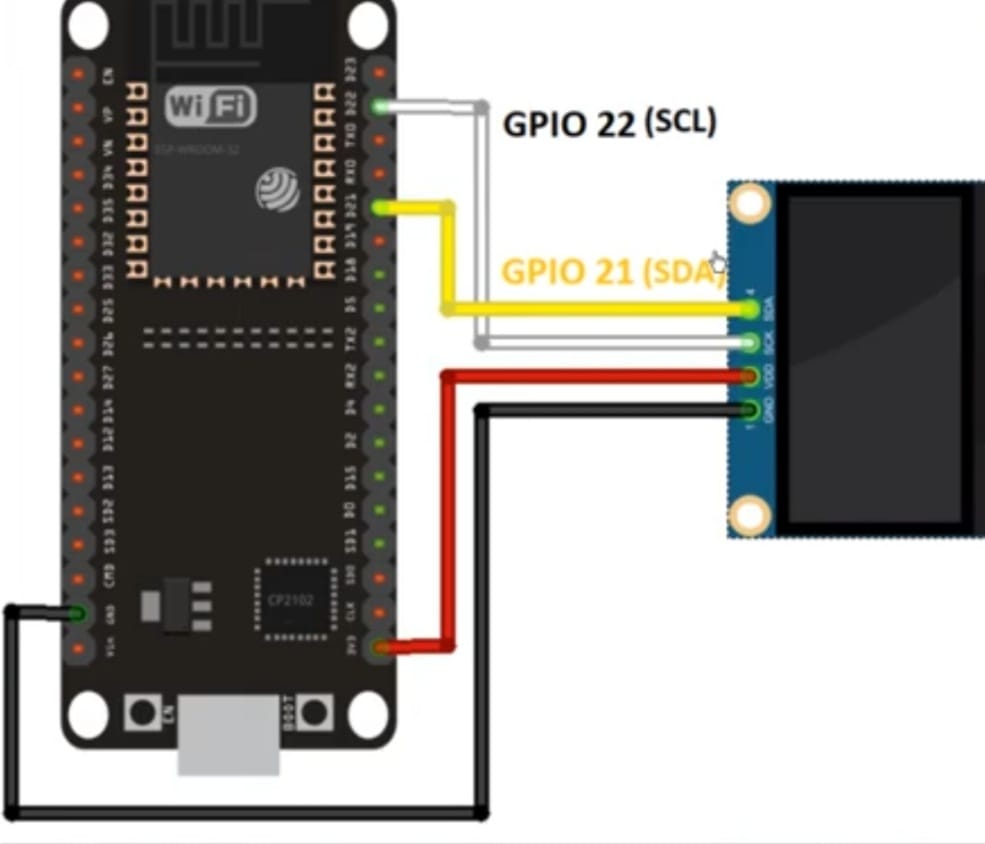
“ <https://dl.espressif.com/dl/package_esp32_index.json>” in preferences in Arduino ide. then we have to go to board manager to download library for esp. 32 library . then we try to to run an example program to connect our mobile Wi-Fi with esp. 32. We have to connect esp. 32 to pc with USB B to USB 2.0 cable.

**Result :** we successfully download esp. 32 library then we successfully run our first program in esp. 32 board . We also able to connect our mobile Wi-Fi with esp. 32.

**Conclusion:** Our esp. 32 is in good and well condition. And its fully functional. And for different Wi-Fi connection we need to change the WIFI name and password.

**3. OLED display initialization:**  (22/06 /23)

**Experimental details**: first we have to download adafruit ssd1306 and adafruit gfx library this is the first initial steps . then we able to use example program . to test oled display . we have to connect gpio pin 21 for sda (serial data) and pin 22 for scl (serial clock) and vcc and gnd . then we have to write our own program using those libraries . to display “ attendance marked for (our name)” in the main program And after 5 sec delay screen will blank . Also we have to show the Ip ADRESS when WIFI is connected with the esp 32. And after 5 sec delay screen will blank .



**Result:** We successfully able to run the first program on oled display . which was showing us the adafruit animation .

Then we write our program display.begin(SSD1306\_SWITCHCAPVCC, SCREEN\_ADDRESS)) to start using display. Then we select text size , text color and cursour position with those comment display.setTextSize(1); display.setTextColor(WHITE);

display.setCursor(0,0);. For print a text display.print("Attendace Marked for ");

and also for clear the display display.clearDisplay();.and also we have to write

display.display(); to show something on OLED display.

**Conclusion:** OLED display is completely functional and first it successfully display adafruit animation. The we successfully able to show our or any written command on it. Also we successfully able to delete the command and make the whole screen blank after a given delay

**4.Buzzer initialization:** (25/06 /23)

**Experimental details**: we connect the buzzer with pin no18. With esp 32 then we create a delay for 1 sec . For those 1 sec buzzer will make noise after that it will stop. this sound will indicate that the attendance is marked.

**Result :** We successfully able to initialize buzzer with ESP32 by using simple command like

Int buzz =18; for make 18 pin the buzzer pin. pinMode(buzz,OUTPUT) for use buzzer as output. digitalWrite(buzz,HIGH);      // when attendance will marked buzzer will starts

delay(1000); for 1 sec delay

digitalWrite(buzz,LOW); to stop the buzzer

and then make function buzz() for buzzer.

**Conclusion:** Buzzer is successfully working now its ready to do its job which is indicated the attendance is marked in the main project.

**5.Creating IFTTT account:** (28/06 /23)

**Experimental details**: We have to create a IFTTT account because ifttt will create database in for of google sheet in google drive .

First we download ifttt in our mobile . then we gave to give the Gmail account in which we want our database get created . In our case we give [saptarshimondal1002@gmail.com](mailto:saptarshimondal1002@gmail.com) . then we use feature if this , then that .

In if this we have to create a trigger to receive web request. We name the web request “fingerprint “ and name or event “fingerprint\_for\_all” .

In then that we create the column for data . 5 different column is created .

1. Date and time (occurred at)
2. Trigger name (fingerprint)
3. Name of student (name)
4. Registration no (ID)
5. Roll and number (rollno)

**Result:** we successfully able to create a google sheet in our google drive name fingerprint\_for\_all . And we successfully able to send demy dada first.

**Conclusion:** We successfully able to send data. Means our IFTTT is perfectly working then we have to put our String Key = "j61K9MUrfwDx6DnCXvsHCd85cA1z5ovEub7YjZm3R\_i";  in the main program to access the google drive of given email id .via ESP32.

**6.Writting our name registration**: (02/07 /23)

**Experimental details**: We have to write our name , roll number , registration number in the main program . and we must follow the order in which we enter our fingerprint in R307 sensor. And our written data will goes to the google sheet when write fingerprint will entered.

Example = here Sumon’s fingerprint id=4 so when Sumon will enter fingerprint then fingerprint associated with no.4 fingerprint ID will get matched if its accuracy is more than 60% .and name , regno(id) ,rollno no will be send in google sheet.

  if (finger.fingerID == 4 ) {

    NAME = "Sumon Dey";

    ID = "D21212222";

    rollno="DJCGETCES6//10010512";

    if (finger.confidence >= 60)

makeIFTTTRequest(); this ifttt request for send data in google sheet .

**Result :**We successfully receive data in google sheet that mean our means our program esp. 32 and IFTTT is perfectly working . IFTTT also send time in database by itself.

**Conclusion:** This data and that program is ready to be a part of our main project. Everything is perfectly working.

**7.Write the whole program:** (08/07 /23)

**Experimental details**: We wrote the main program/sketch for the program. Now this ready to use. We integrate all different component together. which is ESP32, buzzer, OLED display, R307 fingerprint sensor.

**Result:** Our project is successfully working as desired now its ready to use last we create a cart board container for it .

**Conclusion:** we receive data in given Gmail account google dive at looks something like this =

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| July 12, 2023 at 04:24PM | fingerprint | Saptarshi Mondal | D212223112 | DJCGETCES6//10023142 |
| July 12, 2023 at 04:25PM | fingerprint | Srinjoy Chakrabarty | D202110097 | DJCGETCES6//10010225 |

That’s mean our project its completely functional

**CONCLUSION:**

After conducting an in-depth study and implementation of the fingerprint attendance system, it is evident that this technology offers numerous advantages and has the potential to revolutionize the way attendance is managed in various settings. The system has proven to be efficient, secure, and user-friendly, with significant benefits for both administrators and users.

In conclusion, the fingerprint attendance system:

1. Enhances Accuracy: By relying on unique biometric markers, the system ensures a high level of accuracy in recording attendance data, reducing the chances of errors and fraudulent practices.

2. Increases Efficiency: The automation of attendance tracking eliminates the need for manual processes, saving time and resources for educational institutions, businesses, and other organizations.

3. Improves Security: Fingerprint-based authentication provides a robust security layer, preventing unauthorized access and identity theft.

4. Enhances Accountability: The system promotes a sense of accountability among individuals, as they are responsible for their attendance through personal identification.

5. Reduces Costs: Over time, the fingerprint attendance system can lead to cost savings by streamlining attendance management processes and minimizing paperwork.

6. Facilitates Real-Time Monitoring: Administrators can access real-time attendance data, allowing them to make timely decisions and take immediate action if necessary.

7. Supports Contactless Operations: Especially in times of health concerns (like a pandemic), the contactless nature of the system reduces the risk of spreading infections.

8. Encourages Punctuality: The presence of an accurate and efficient attendance system encourages individuals to be more punctual and responsible.

9. Provides Scalability: The system can be easily scaled to accommodate various group sizes, from small businesses to large educational institutions.

10. Promotes Technological Advancement: By adopting fingerprint attendance systems, organizations demonstrate their commitment to embracing innovative technologies for improved operations.

However, it is essential to acknowledge that while the fingerprint attendance system offers numerous advantages, there may be some challenges as well. These may include concerns related to privacy, data protection, and the initial setup cost of the system.

In light of these considerations, organizations should weigh the benefits against potential challenges and implement appropriate measures to address any issues that arise. With proper planning, training, and awareness, the fingerprint attendance system can be a valuable tool in enhancing attendance management and fostering efficiency and security in various domains.

**FUTURE SCOPE:**

The future scope of your fingerprint attendance system project is promising, as biometric technologies continue to evolve and find new applications in various domains. Here are some potential areas of growth and expansion for your project:

1. Integration with Smart Devices: As smart devices become more prevalent in our daily lives, integrating the fingerprint attendance system with smartphones, tablets, and wearable devices could open up new possibilities for seamless and convenient attendance tracking.

2. Internet of Things (IoT) Connectivity: Incorporating IoT capabilities into the system could enable real-time data synchronization and remote monitoring, allowing administrators to access attendance information from anywhere, anytime.

3. Advanced Analytics and Reporting: Implementing advanced analytics and reporting features will provide valuable insights into attendance patterns, trends, and potential areas for improvement. This data-driven approach can help optimize resource allocation and decision-making.

4. Biometric Multi-Modal Systems: Exploring the integration of multiple biometric modalities, such as fingerprint, facial recognition, and voice recognition, could enhance the system's accuracy and security even further.

5. Cloud-Based Solutions: Developing a cloud-based version of the system would facilitate easy deployment and scalability, making it accessible to a broader range of organizations and institutions.

6. AI-Powered Enhancements: Leveraging artificial intelligence and machine learning algorithms can optimize the system's performance, continuously improving recognition accuracy and adaptability to different environments.

7. Secure Authentication for Transactions: The fingerprint attendance system could be extended to provide secure authentication for financial transactions, online services, and access to sensitive data.

8. Biometric Access Control: Integrating the system with physical access control systems could enhance security in buildings, laboratories, and restricted areas, reducing the reliance on traditional keycards or passwords.

9. Collaborations with Industry Verticals: Exploring partnerships with industries like healthcare, finance, and government sectors could lead to customized solutions tailored to specific needs.

10. Global Implementation: Expanding the project's reach to international markets and diverse cultural contexts could offer new opportunities for adoption and growth.

11. Continuous Research and Development: Staying updated with the latest advancements in biometric technologies and engaging in ongoing research and development will ensure the system remains at the forefront of innovation.

12. Compliance and Privacy Measures: Addressing data privacy and security concerns will be crucial for gaining trust from users and meeting regulatory requirements in different regions.

Overall, the future scope of your fingerprint attendance system project is bright, with the potential to make a significant impact in various industries and contribute to the broader adoption of biometric solutions in everyday applications. As technology continues to advance, your project can play a pivotal role in shaping the future of attendance management and biometric authentication systems.