RFID Smart Attendance system with google sheet & door unlocking system

This mini project work is submitted in partial fulfilment of the requirement for the degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

SUBMITTED BY

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Certificate of Recommendation

I hereby recommend that the preliminary thesis report entitled, "**RFID Smart Attendance system with google sheet & door unlocking system**" carried out under my supervision by the student listed below may be accepted for the evaluation of Mini Project (EC 681) of "Bachelor of Technology in ECE" of Asansol Engineering College under MAKAUT.

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Certificate of Approval

The forgoing mini project document is hereby approved as creditable study of an engineering subject carried out and presented in a manner satisfactory to warrant its acceptance as prerequisite to the degree for which it has been submitted. It is understood that this approve this approval the undersigned does not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but the approve the thesis only for the purpose for which it is submitted.

(……..)

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ABSTRACT

The RFID Attendance System with Google Sheet Integration and Door Unlocking Mechanism is a comprehensive solution designed to streamline attendance tracking and access control processes in various environments. This system utilizes Radio Frequency Identification (RFID) technology to efficiently record attendance data, seamlessly integrate it with Google Sheets, and facilitate door unlocking based on authorized access.

The system consists of three primary components: RFID readers, a centralized server, and door locking mechanisms. RFID readers are strategically placed at entry points and configured to detect unique RFID tags assigned to individuals. When a person with a registered RFID tag approaches an RFID reader, the system captures the tag's information, identifies the individual, and records the attendance data.

To facilitate efficient data management, the system leverages Google Sheets as a cloud-based database. Attendance records captured by the RFID readers are automatically synchronized and updated in real-time to a designated Google Sheet. This integration enables easy access to attendance data, simplifies record-keeping, and allows for data analysis and reporting.

Additionally, the system incorporates a door unlocking mechanism based on authorized access. Authorized individuals can be granted access to specific areas by assigning appropriate permissions in the system's configuration. When an authorized person presents their RFID tag to the reader at a secured door, the system validates their access privileges and unlocks the door if granted.

The RFID Attendance System with Google Sheet Integration and Door Unlocking Mechanism offers several benefits, including accurate and automated attendance tracking, real-time data synchronization, streamlined record-keeping, improved security through authorized access control, and simplified data analysis for attendance reports. It can be implemented in various settings such as educational institutions, corporate offices, research facilities, and other environments where attendance tracking and access control are essential.

CONTENT

INTRODUCTION

The RFID Attendance System with Google Sheet Integration and Door Unlocking System combines advanced RFID technology, cloud-based data management, and access control mechanisms to create an efficient and secure solution for attendance tracking and door access in various settings. This system addresses the challenges associated with traditional attendance management methods and enhances the overall security and convenience of access control systems. Attendance tracking is a crucial process in many environments, including educational institutions, workplaces, and research facilities. Traditional methods, such as manual sign-in sheets or barcode scanning, can be time-consuming, prone to errors, and lack real-time data updates. The RFID Attendance System offers a more accurate and automated approach by leveraging RFID technology.

RFID readers are strategically positioned at entry points, allowing individuals to simply present their RFID tags for identification. Each RFID tag is uniquely assigned to an individual and contains specific information, such as their name, employee or student ID, and other relevant details. When a person presents their RFID tag to the reader, the system captures the tag's information, instantly identifies the individual, and records their attendance data.

To ensure seamless data management and accessibility, the system integrates with Google Sheets, a widely used cloud-based spreadsheet platform. Attendance records captured by the RFID readers are automatically synchronized and updated in real-time to a designated Google Sheet. This integration eliminates the need for manual data entry, reduces the chances of errors, and provides a centralized and easily accessible database for attendance tracking.

MOTIVATION

The motivation behind the development of the RFID Attendance System with Google Sheet Integration and Door Unlocking System stems from several key factors that address the limitations and challenges of traditional attendance management and access control methods. The following motivations highlight the driving forces behind this innovative system:

Accuracy and Efficiency: Traditional attendance management systems often rely on manual processes prone to errors, such as sign-in sheets or barcode scanning. The RFID Attendance System improves accuracy by automating the attendance tracking process. RFID technology ensures precise identification of individuals, eliminating the possibility of human error or intentional manipulation.

Real-time Data Updates: The need for real-time attendance data is crucial in many environments. With traditional methods, attendance records are often manually transferred to spreadsheets or databases, leading to delays and outdated information. The integration of the RFID Attendance System with Google Sheets enables instantaneous synchronization and updates of attendance data, ensuring that administrators have access to up-to-date information at all times.

Streamlined Data Management: Handling and managing attendance data manually can be a time-consuming and cumbersome task. By integrating with Google Sheets, the RFID Attendance System centralizes attendance records in a cloud-based platform. This integration simplifies data management, eliminates the need for manual data entry, and provides a user-friendly interface for administrators to access, analyze, and generate reports on attendance data.

Enhanced Security: Traditional access control systems often rely on physical keys or access cards, which can be lost, stolen, or duplicated. The RFID Attendance System improves security by utilizing RFID tags that are uniquely assigned to individuals. This prevents unauthorized access and reduces the risk of security breaches. Additionally, the system's door unlocking mechanism grants access only to authorized individuals, strengthening overall security measures.

Scalability and Flexibility: The RFID Attendance System is highly scalable and adaptable to various environments. Whether implemented in educational institutions, corporate offices, or research facilities, the system can easily accommodate different organizational structures and attendance policies. It can also be expanded to include multiple entry points and integrated with existing security systems for seamless integration and enhanced functionality.

Cost-effectiveness: Implementing and maintaining traditional attendance management and access control systems can incur significant costs, including manual labor, paper-based record-keeping, and physical key management. The RFID Attendance System reduces costs by automating processes, minimizing errors, and eliminating the need for manual data entry and physical keys.

DESIGN METHODOLOGY

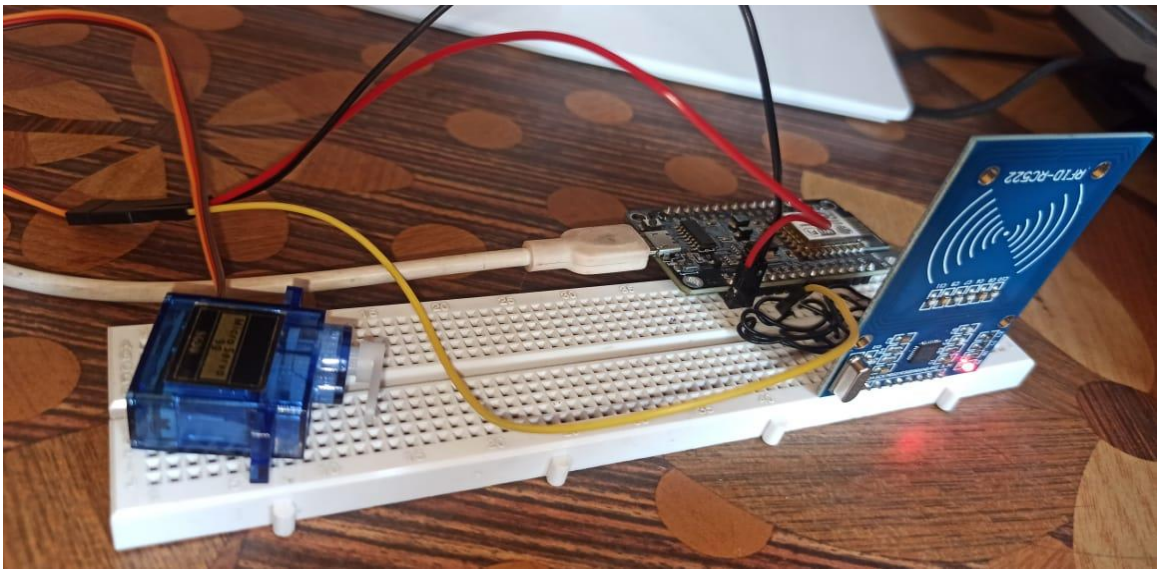
The design methodology of the RFID Attendance System with Google Sheet Integration and Door Unlocking System involves several key steps to ensure the successful implementation of the system. The following outlines the general design process:

Requirements Gathering: This includes understanding the specific needs of the environment where the system will be implemented, such as the number of users, access control requirements, attendance tracking policies, and any integration preferences with existing systems.

RFID Hardware Selection: Based on the requirements, suitable RFID hardware components are selected, including RFID readers and RFID tags. Factors to consider include the range of the RFID readers, compatibility with the chosen RFID tag technology (such as HF or UHF), and the ability to read multiple tags simultaneously if needed.

Database Design and Google Sheets Integration: The design of the database structure is crucial for efficient data management. The database design involves creating the necessary fields to capture relevant information, such as user details, RFID tag IDs, timestamps, and access privileges. Integration APIs or libraries provided by Google Sheets are utilized to establish a connection and enable real-time synchronization between the RFID system and the Google Sheet.

System Architecture: The system architecture is designed to ensure smooth communication between the RFID readers, the central server, and the Google Sheets database. This includes determining the network topology, protocols, and communication channels. The server acts as the central hub for processing RFID data, validating access permissions, and controlling the door unlocking mechanism.



WORKING

The RFID Attendance System with Google Sheet Integration and Door Unlocking System combines RFID technology, cloud-based data management, and access control mechanisms to provide efficient attendance tracking and door unlocking capabilities. The following outlines the working of the system:

RFID Tag Assignment: Each individual who requires attendance tracking and access control is assigned a unique RFID tag. The RFID tag contains specific information such as the person's name, employee or student ID, and any other relevant details.

RFID Readers and Data Capture: RFID readers are strategically placed at entry points or access-controlled areas. When an individual approaches the reader and presents their RFID tag, the reader captures the tag's information through wireless communication.

Attendance Data Processing: The captured RFID tag information is processed by the system's central server. The server identifies the individual associated with the tag by cross-referencing the tag information with the stored database. The attendance data, including the individual's details and timestamp, is then generated.

Google Sheets Integration: The attendance data is seamlessly integrated with Google Sheets, a cloud-based spreadsheet platform. The system utilizes APIs or libraries provided by Google Sheets to establish a connection and update the attendance records in real-time. This integration allows for centralized and easily accessible attendance data.

Door Unlocking Mechanism: The system incorporates a door unlocking mechanism based on authorized access. Access privileges are assigned to individuals in the system's configuration, specifying the areas they are allowed to enter. When an authorized person presents their RFID tag to the reader at a secured door, the system verifies their access privileges.

Access Validation and Door Unlocking: The system validates the presented RFID tag against the authorized access privileges stored in the database. If the person has the necessary permissions, the system sends a signal to unlock the door, granting access to the individual. If the access privileges are not granted or the RFID tag is not recognized, the door remains locked.

Real-time Monitoring and Reporting: Administrators can monitor attendance data and access events in real-time through the Google Sheets platform or a dedicated user interface. They can generate reports, analyze attendance patterns, and perform data analysis for attendance management purposes.

System Management and Maintenance: The system provides an interface for administrators to manage user information, assign access privileges, and configure system settings. Regular maintenance and updates ensure optimal performance, including updating the database, managing RFID tags, and resolving any technical issues.

Overall, the RFID Attendance System with Google Sheet Integration and Door Unlocking System automates attendance tracking, seamlessly integrates data with Google Sheets, and enhances security through authorized access control. By combining RFID technology, cloud-based data management, and door unlocking mechanisms, this system provides an efficient and secure solution for attendance management and access control in various environments.

COMPONENTS USED

The Component required for development of the project are as follows:-

- Node MCU ESP8266
- RC552 RFID reader
- RFID tags
- Breadboard
- Servo motor
- Jumper wire
- Connecting wires

1. The Node MCU ESP8266

The Node MCU ESP8266 is a popular open-source development board that incorporates the ESP8266 Wi-Fi module. It provides an easy-to-use platform for IoT (Internet of Things) projects and is widely used for building connected devices and prototypes. Here are some key features and functionalities of the Node MCU ESP8266. The ESP8266 Wi-Fi module, which enables wireless connectivity and communication. It supports 2.4GHz Wi-Fi networks and can act as a Wi-Fi client or create its own Wi-Fi access point. The Node MCU ESP8266 is equipped with a built-in microcontroller unit (MCU) that runs the Lua programming language. The MCU provides processing power for running code and executing tasks on the board. The Node MCU ESP8266 board comes with a micro USB port for power supply and serial communication. It can be connected to a computer for programming, debugging, and power input. Arduino IDE Support: While the Node MCU ESP8266 board primarily uses the Lua programming language, it can also be programmed using the Arduino Integrated Development Environment (IDE). This provides developers with the flexibility to choose their preferred programming language. Community Support and Libraries: The Node MCU ESP8266 has a large and active community of developers, which means there is extensive support and a wide range of libraries available. These libraries provide ready-to-use functions and code snippets for common IoT tasks, making development faster and more convenient.

2. RC552 RFID reader

The RC522 RFID reader module is a popular RFID module that is commonly used for RFID-based projects. It is compatible with various microcontrollers and provides an interface for reading RFID tags. The RC522 RFID reader module supports a wide range of RFID tags operating at a frequency of 13.56 MHz. It is compatible with standard RFID tags such as MIFARE Classic 1K, MIFARE Classic 4K, MIFARE Ultralight, and NTAG203.The RC522 module communicates with a microcontroller using the Serial Peripheral Interface (SPI) protocol. This interface allows for fast and reliable data transfer between the RFID reader module and the microcontroller. The RC522 RFID reader module can perform both read and write operations on RFID tags. It can read the unique identification number (UID) of the RFID tags and can also write data to specific memory sectors of compatible tags, depending on the tag's capabilities. RC522 module is equipped with an integrated antenna for communication with RFID tags. The range of the module depends on factors such as the size of the antenna, power supply, and environmental conditions. Generally, the effective range of the RC522 module is within a few centimeters to a few inches.The RC522 module provides interrupt capabilities, allowing it to notify the microcontroller when certain events occur, such as the detection of an RFID tag or the completion of an operation. It also has a standby mode, which reduces power consumption when the module is not actively performing operations.

3. RFID tags

RFID tags are small electronic devices that store and transmit data wirelessly using radio frequency identification (RFID) technology. These tags consist of an integrated circuit (IC) and an antenna, which enable communication with RFID readers. Passive RFID tags do not have an internal power source and rely on the energy emitted by the RFID reader to power the tag's operation. When brought into the electromagnetic field of an RFID reader, the reader's energy induces a current in the tag's antenna, allowing it to transmit data back to the reader. Passive tags are typically more affordable, smaller in size, and have a longer operational lifespan since they don't contain a battery. They are commonly used for applications such as inventory management, supply chain tracking, and access control. Active RFID tags have their own power source, usually a battery, which allows them to actively transmit data to an RFID reader. Active tags can operate at longer distances compared to passive tags and can provide real-time tracking and monitoring capabilities. These tags are commonly used in applications where longer range and continuous monitoring are required, such as asset tracking, vehicle identification, and tracking of high-value items.Semi-passive RFID tags, also known as battery-assisted passive (BAP) tags, combine features of both passive and active tags. They use a small internal battery to power certain functions of the tag, such as memory storage and signal transmission, while still relying on the RFID reader's energy to power the majority of their operation. Semi-passive tags offer a balance between extended read range and longer battery life compared to active tags. They are commonly used in applications such as temperature monitoring, healthcare, and logistics.

4. servo motor

A servo motor is a type of electromechanical device that is widely used for precise control of angular position. It is commonly used in various applications, including robotics, automation, remote control systems, and electronics projects. Servo motors are designed to accurately control the angular position of the output shaft. They can rotate from 0 to 180 degrees or even more, depending on the specific model. The rotational movement is typically achieved using a closed-loop control system. Servo motors incorporate a feedback mechanism, such as a potentiometer or an encoder, to provide positional feedback to the control system. This feedback allows the motor to adjust its position and maintain accuracy based on the control signals it receives. Servo motors can provide a significant amount of torque, allowing them to exert force to move or hold objects. The torque output of a servo motor depends on the specific model and can vary from small torque for lightweight applications to high torque for more demanding tasks. Servo motors can be controlled to rotate at different speeds, depending on the requirements of the application. The rotational speed is determined by the control signal and the mechanical characteristics of the motor. Servo motors are available in various sizes, ranging from small micro servos to larger servos for heavy-duty applications. Their compact size makes them suitable for integration into space-constrained projects and devices. Servo motors often come with mounting brackets or fittings that facilitate easy installation and integration into mechanical systems. These mounting options allow for secure attachment and connection to other components.

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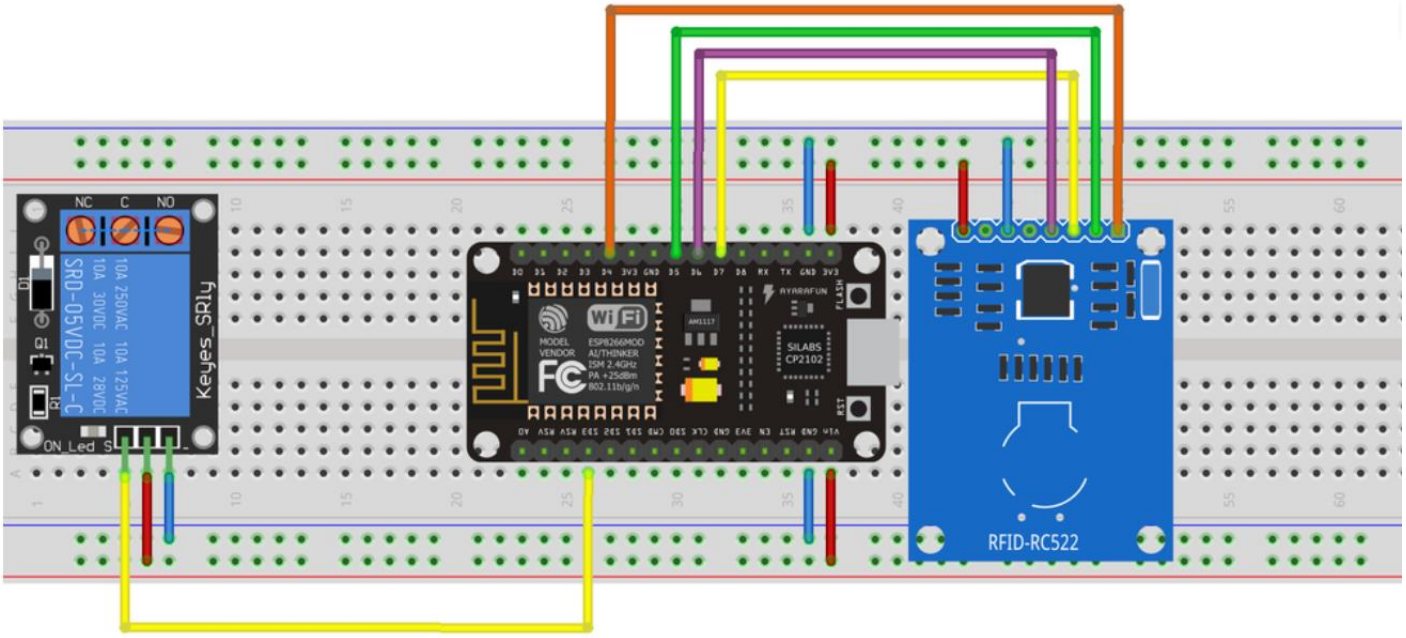
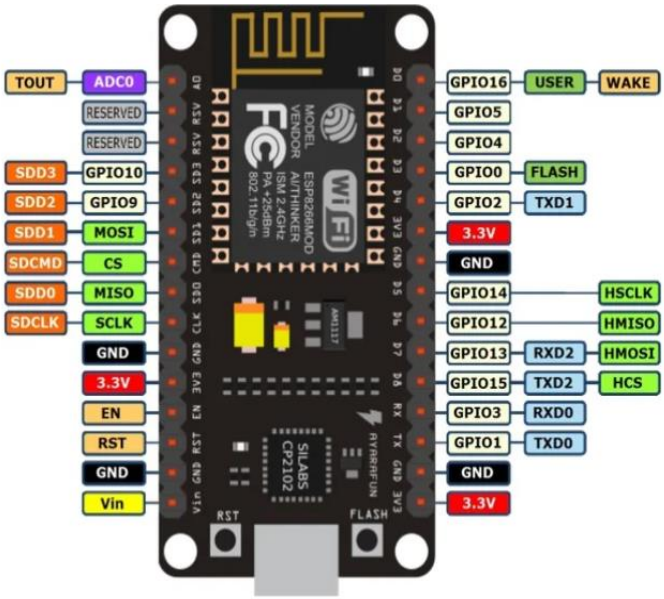
CIRCUIT DIAGRAM





NODE MCU PIN DIAGRAM

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CODE FOR G SHEET :-

```
var ss =
SpreadsheetApp.openById('1amw0aj5JHL3f8_q_rNOFZvvALnhQglL0lfFw675pr5U');
var sheet = ss.getSheetByName('Sheet1');
var timezone = "asia/India";
function doGet(e){
 Logger.log( JSON.stringify(e) );

 if (e.parameter == 'undefined') {
  return ContentService.createTextOutput("Received data is undefined");
 }

 var Curr_Date = new Date();
 var Curr_Time = Utilities.formatDate(Curr_Date, timezone, 'HH:mm:ss');
 var name = stripQuotes(e.parameters.name);
 var nextRow = sheet.getLastRow() + 1;
 sheet.getRange("A" + nextRow).setValue(Curr_Date);
 sheet.getRange("B" + nextRow).setValue(Curr_Time);
 sheet.getRange("C" + nextRow).setValue(name);
 return ContentService.createTextOutput("Card holder name is stored in column C");
}


function stripQuotes( value ) {
 return value.toString().replace(/^["']|["']$/g, "");
}

function doPost(e) {
 var val = e.parameter.value;

 if (e.parameter.value !== undefined){
  var range = sheet.getRange('A2');
  range.setValue(val);
 }
}
```

CODE FOR NODE MCU :-

```
#include <SPI.h>
#include <MFRC522.h>
#include <Arduino.h>
#include <ESP8266WiFi.h>
#include <ESP8266HTTPClient.h>
#include <WiFiClient.h>
#include <WiFiClientSecureBearSSL.h>
#include <Servo.h>

#define RST_PIN  D1
#define SS_PIN   D2

MFRC522 mfrc522(SS_PIN, RST_PIN);
MFRC522::MIFARE_Key key;
MFRC522::StatusCode status;


int blockNum = 2;

byte bufferLen = 18;
byte readBlockData[18];

String card_holder_name;
```

```
const String sheet_url = "https://script.google.com/macros/s/AKfycbzFGjK-KuLVMToBxF-WwSYpP6OaDym3zb51X7bK7AoD6fySK2qjcpByUlB7M1rrguk9/exec?name=";

const uint8_t fingerprint[20] = {0x08, 0x73, 0x2C, 0x18, 0x30, 0x14, 0x52, 0xC3, 0xCA, 0x3E, 0x02, 0x79, 0x65, 0xB4, 0xFE, 0x90, 0xAC, 0x3F, 0x3E, 0x33};

#define WIFI_SSID "redmi"

#define WIFI_PASSWORD "1234567890"

Servo servo;

int servoPosition = 0;

void setup()

{

 Serial.begin(9600);

Serial.setDebugOutput(true);

 Serial.println();

 Serial.print("Connecting to AP");

  WiFi.begin(WIFI_SSID, WIFI_PASSWORD);

  while (WiFi.status() != WL_CONNECTED){

    Serial.print(".");

    delay(200);

  }

  Serial.println("");

  Serial.println("WiFi connected.");

  Serial.println("IP address: ");

  Serial.println(WiFi.localIP());

  Serial.println();

  SPI.begin();

  servo.attach(D8);}
```

```
void loop()
{
 mfrc522.PCD_Init();
 if (!mfrc522.PICC_IsNewCardPresent()) {
   return;
 }

 if (!mfrc522.PICC_ReadCardSerial()) {
   return;
 }

 Serial.println();
 Serial.println(F("Reading last data from RFID..."));
 ReadDataFromBlock(blockNum, readBlockData);

 //mfrc522.PICC_DumpToSerial(&(mfrc522.uid));

 /* Print the data read from block */
 Serial.println();
 Serial.print(F("Last data in RFID:"));
 Serial.print(blockNum);
 Serial.print(F(" --> "));
 for (int j = 0; j < 16; j++)
 {
   Serial.write(readBlockData[j]);
 }
 Serial.println();
 servo.write(90);
 delay(1000);
```

```
 servo.write(0);


 if (WiFi.status() == WL_CONNECTED) {
   std::unique_ptr<BearSSL::WiFiClientSecure>client(new BearSSL::WiFiClientSecure);


   client->setFingerprint(fingerprint);
   card_holder_name = sheet_url + String((char*)readBlockData);
   card_holder_name.trim();
   Serial.println(card_holder_name);
   //---------------------------------------------------------------
   HTTPClient https;
   Serial.print(F("[HTTPS] begin...\n"));
   if (https.begin(*client, (String)card_holder_name)){
     Serial.print(F("[HTTPS] GET...\n"));
     int httpCode = https.GET();
     if (httpCode > 0) {
       Serial.printf("[HTTPS] GET... code: %d\n", httpCode);
     }
     else
     {
       Serial.printf("[HTTPS] GET... failed, error: %s\n",
https.errorToString(httpCode).c_str());
     }
     https.end();
     delay(1000);
   }
   else {
     Serial.printf("[HTTPS} Unable to connect\n");
   }
```

```
}
void ReadDataFromBlock(int blockNum, byte readBlockData[])
{
  for (byte i = 0; i < 6; i++) {
    key.keyByte[i] = 0xFF;
  }
  status = mfrc522.PCD_Authenticate(MFRC522::PICC_CMD_MF_AUTH_KEY_A,
blockNum, &key, &(mfrc522.uid));
  if (status != MFRC522::STATUS_OK) {
    Serial.print("Authentication failed for Read: ");
    Serial.println(mfrc522.GetStatusCodeName(status));
    return;
  }
  else {
    Serial.println("Authentication success");
  }
  status = mfrc522.MIFARE_Read(blockNum, readBlockData, &bufferLen);
  if (status != MFRC522::STATUS_OK) {
    Serial.print("Reading failed: ");
    Serial.println(mfrc522.GetStatusCodeName(status));
    return;
  }
  else {
    Serial.println("Block was read successfully");
  }
}
```

RESULT:-

SERIAL MONITOR OUTPUT:-

COM3

```
10:59:56.547 -> ??
10:59:56.643 -> SDK:2.2.2-dev(38a443e)/Core:3.0.2=30002000/lwIP:STABLE-2_1_2_RELEASE/glue:1.2-48-g7421258/BearSSL:6105635
10:59:56.739 ->
10:59:56.739 -> Connecting to APfpm close 1
10:59:56.786 -> mode : sta(68:c6:3a:fb:d9:88)
10:59:56.786 -> add if0
10:59:56.786 -> ..............scandone
11:00:00.437 -> state: 0 -> 2 (b0)
11:00:00.437 -> .state: 2 -> 3 (0)
11:00:00.484 -> state: 3 -> 5 (10)
11:00:00.532 -> add 0
11:00:00.532 -> aid 1
11:00:00.532 -> cnt
11:00:00.532 -> state: 5 -> 2 (2c0)
11:00:00.532 -> rm 0
11:00:00.626 -> .....reconnect
11:00:01.531 -> state: 2 -> 0 (0)
11:00:01.626 -> .scandone
11:00:01.626 -> state: 0 -> 2 (b0)
11:00:01.626 -> state: 2 -> 3 (0)
11:00:01.673 -> state: 3 -> 5 (10)
11:00:01.721 -> add 0
11:00:01.721 -> aid 1
11:00:01.721 -> cnt
11:00:01.721 ->
11:00:01.721 -> connected with redmi, channel 6
11:00:01.770 -> dhcp client start...
11:00:01.770 -> ip:192.168.19.196,mask:255.255.255.0,gw:192.168.19.104
11:00:01.817 ->
11:00:01.865 -> WiFi connected.
11:00:01.865 -> IP address:
11:00:01.865 -> 192.168.19.196
11:00:01.865 ->
11:00:03.479 ->
11:00:03.479 -> Reading last data from RFID...
11:00:03.527 -> Authentication success
11:00:03.527 -> Block was read successfully
11:00:03.575 ->
11:00:03.575 -> Last data in RFID:2 --> Faraz_055
```

DATABASE OUTPUT:-

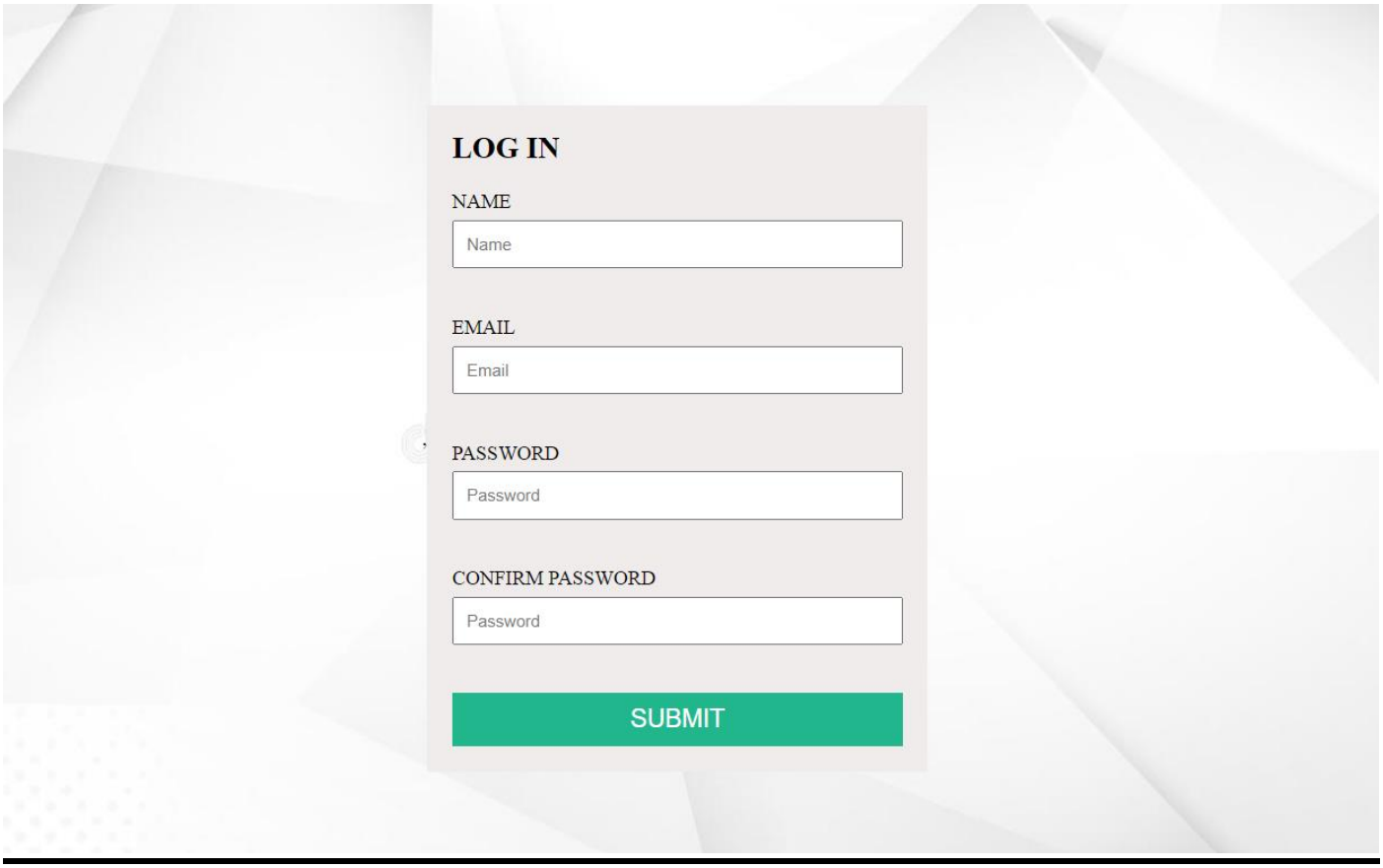
rfid

File Edit View Insert Format Data Tools Extensions Help

G6

	A	B	C
1	DATE	TIME	NAME_ROLL
2	21/05/2023	19:40:59	Agnisis_53
3	21/05/2023	10:15:30	Anchal_42
4	21/05/2023	11:20:45	Prabal_38
5	21/05/2023	12:30:15	Faraz_55
6	21/05/2023	13:45:55	Anchal_42
7	21/05/2023	14:55:10	Prabal_38
8	21/05/2023	14:55:10	Faraz_55
9	21/05/2023	15:40:25	Agnisis_53
10	21/05/2023	16:55:35	Anchal_42
11	21/05/2023	16:55:35	Prabal_38
12	21/05/2023	17:10:20	Agnisis_53
13	22/05/2023	09:55:25	Anchal_42
14	22/05/2023	09:55:25	Prabal_38
15	22/05/2023	10:10:30	Anchal_42
16	22/05/2023	11:25:50	Prabal_38
17	22/05/2023	12:35:15	Agnisis_53
18	22/05/2023	45:20:00	Agnisis_53
19	22/05/2023	14:55:35	Anchal_42
20	22/05/2023	15:10:40	Prabal_38
21	22/05/2023	16:25:55	Faraz_55
22	22/05/2023	18.09.56	Anchal_42
23			
24			
25			
26			
27			

WEBSITE :



LIMITATIONS:-

- This RFID system is for small case application purpose .
- Data stored in google sheet provide limited facility.
- Authentication system can be made better using other Auth Service .
- NodeMcu can handle limited operations to include lcd or buzzer we need more io ports .
- An Adruino uno is much more efficient but costly.
- RFID scanner can be used of higher frequency to increase acceptance of long range RFID tags/cards.

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OTHER SOURCES:-

1.Youtube Tutorials

2.Official Documentation

Conclusion

The RFID attendance system implemented with NodeMCU and servo motor for door unlocking provides an efficient and secure solution for attendance management and access control. This system utilizes RFID technology to accurately identify individuals, eliminating manual attendance tracking and reducing the risk of unauthorized access. The integration of the NodeMCU microcontroller board enables seamless connectivity and real-time data processing. The servo motor serves as a reliable mechanism for unlocking the door, responding promptly to valid RFID card scans. This system improves efficiency, minimizes errors, enhances security, and ensures accountability. It is a comprehensive solution for organizations seeking to streamline attendance management and enhance access control measures.

Future Scope

1.Include Biometric sensor for Fingerprint authentication.

2.Include camera module for face recognition.

3.Data can be used for monitoring for specific data analysis work.

4.Realtime facial recognition can be used to track students' engagement time in the class.

5.More no of validation can be added to make the system more secure for admin.