RFID-Based Door Lock System Using Arduino

Project Overview

This project allows users to unlock a door using an **RFID card/tag**. When a valid RFID tag is scanned, the **servo motor unlocks the door**, and an **LCD screen displays a success message**. Unauthorized access attempts trigger a **buzzer alert**.

Objectives

✅ **Authenticate users using RFID tags/cards.**
✅ **Unlock door using a servo motor.**
✅ **Display messages on an LCD screen.**
✅ **Trigger an alarm for unauthorized access.**

Components Required

1. **Arduino Uno** – Main controller.
2. **RFID Module (RC522)** – Reads RFID tags/cards.
3. **Servo Motor (SG90/MG995)** – Controls door locking.
4. **16x2 LCD Display (Optional)** – Shows access messages.
5. **Buzzer** – Alerts for unauthorized access.
6. **LEDs (Green & Red)** – Indicates access status.
7. **Jumper Wires & Breadboard** – For connections.
8. **5V Power Supply** – Powers the system.

How the System Works

1. The **RFID module (RC522)** scans a tag/card.
2. If the tag **matches a stored ID**, the **servo motor unlocks the door**.
3. The **LCD screen** displays "Access Granted".
4. If the tag is **not recognized**, the **buzzer sounds** and the **LCD shows "Access Denied"**.

Circuit Diagram

RFID Module (RC522) to Arduino

RFID RC522 Pin	Arduino Uno Pin
VCC	3.3V
GND	GND
RST	D9
SDA (SS)	D10
MOSI	D11
MISO	D12
SCK	D13

Servo Motor to Arduino

Servo Pin	Arduino Pin
VCC	5V
GND	GND
Signal	D6

Buzzer & LED Indicators

Component	Arduino Pin
Buzzer	D5
Green LED	D3
Red LED	D4

Arduino Code for RFID Door Lock System

This code **compares scanned RFID tags** with stored IDs and **controls the servo** accordingly.

```
#include <SPI.h>
#include <MFRC522.h>
#include <Servo.h>

#define SS_PIN 10
#define RST_PIN 9
#define BUZZER 5
#define GREEN_LED 3
#define RED_LED 4
#define SERVO_PIN 6

MFRC522 rfid(SS_PIN, RST_PIN);
Servo doorServo;
```

```
// Define authorized RFID card UID
byte authorizedUID[] = {0xA1, 0xB2, 0xC3, 0xD4};  // Change this to your
card's UID

void setup() {
  Serial.begin(9600);
  SPI.begin();
  rfid.PCD_Init();

  pinMode(BUZZER, OUTPUT);
  pinMode(GREEN_LED, OUTPUT);
  pinMode(RED_LED, OUTPUT);

  doorServo.attach(SERVO_PIN);
  doorServo.write(0);  // Door starts locked
}

void loop() {
  if (!rfid.PICC_IsNewCardPresent() || !rfid.PICC_ReadCardSerial()) {
    return;
  }

  Serial.print("Card UID: ");
  for (byte i = 0; i < rfid.uid.size; i++) {
    Serial.print(rfid.uid.uidByte[i], HEX);
    Serial.print(" ");
  }
  Serial.println();

  if (checkAccess()) {
    Serial.println("Access Granted!");
    digitalWrite(GREEN_LED, HIGH);
    digitalWrite(RED_LED, LOW);
    doorServo.write(90);  // Unlock door
    delay(3000);  // Keep door open for 3 seconds
    doorServo.write(0);   // Lock door again
    digitalWrite(GREEN_LED, LOW);
  } else {
    Serial.println("Access Denied!");
    digitalWrite(RED_LED, HIGH);
    digitalWrite(GREEN_LED, LOW);
    digitalWrite(BUZZER, HIGH);
    delay(1000);
    digitalWrite(BUZZER, LOW);
    digitalWrite(RED_LED, LOW);
  }

  rfid.PICC_HaltA();
  rfid.PCD_StopCrypto1();
}

bool checkAccess() {
  for (byte i = 0; i < rfid.uid.size; i++) {
    if (rfid.uid.uidByte[i] != authorizedUID[i]) {
      return false;
    }
  }
```

```
  return true;
}
```

How to Use the RFID Door Lock System

1. **Upload the code** to the Arduino.
2. **Scan an RFID tag/card** on the **RFID module**.
3. If the card is **authorized**, the **servo unlocks the door**.
4. If the card is **unauthorized**, the **buzzer sounds** and the **door remains locked**.
5. (Optional) **Add more RFID tags** by modifying the `authorizedUID[]` array.

Features & Benefits

✅ **Secure access control** using RFID technology.
✅ **Quick and easy authentication** with RFID cards.
✅ **Buzzer alert system** for unauthorized access.
✅ **Servo motor locks/unlocks door** based on RFID scan.
✅ **Scalable** – Add multiple authorized cards.

Future Enhancements

Use an LCD screen to display user messages.
Store multiple RFID tags in EEPROM for dynamic access.
Connect to Wi-Fi to log access attempts in Firebase.
Use a solenoid lock for stronger security.
Add a keypad for dual authentication (RFID + PIN).