VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE, MUMBAI

Design Thinking and Innovation

Door Security using Arduino

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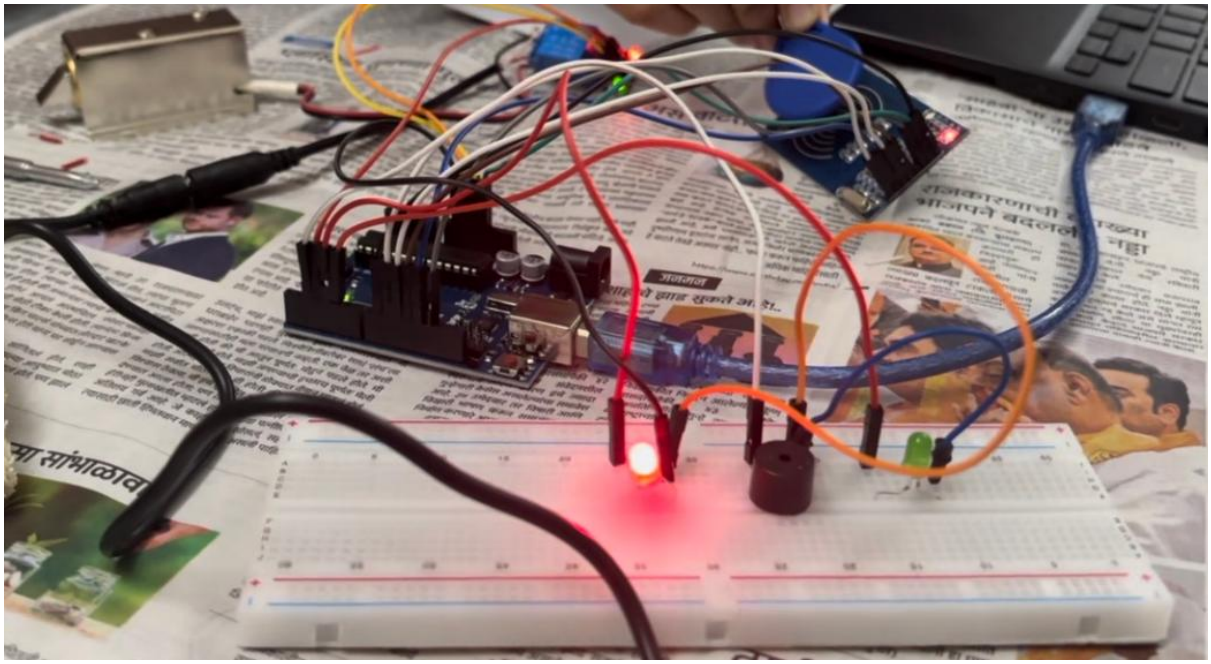
Index:

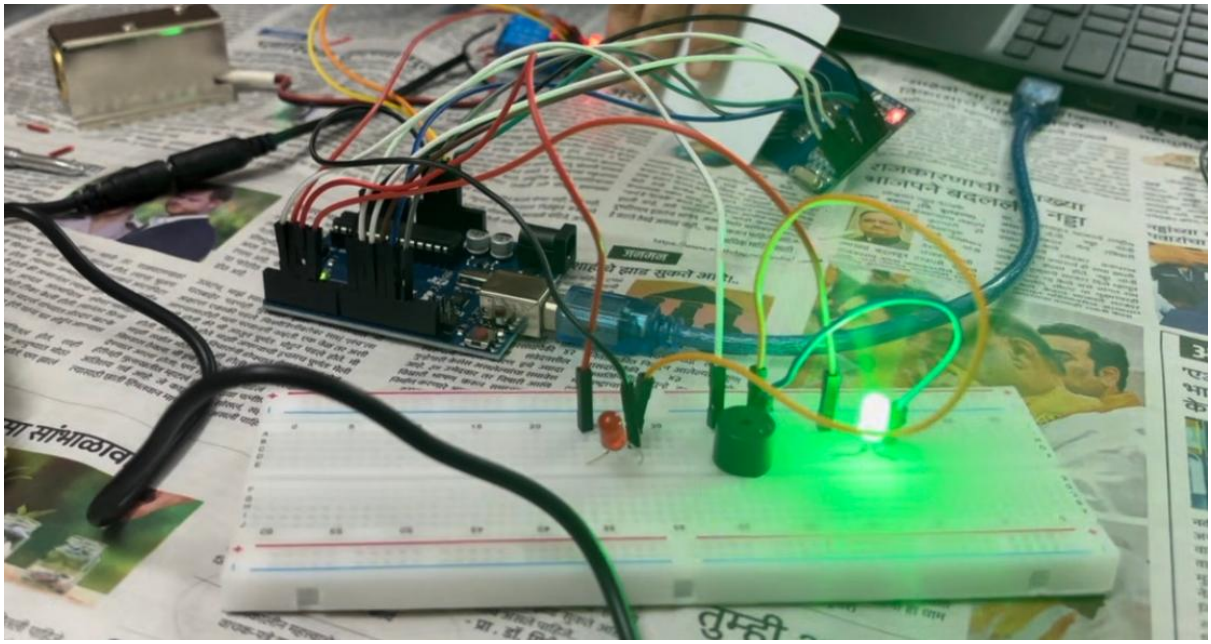
Introduction:-

The Door Security Lock System project aims to enhance the security of a door by implementing an RFID-based access control system. This system allows authorized individuals to gain access through the door while denying entry to unauthorized persons

When wrong card is used red light turns on and buzzer makes sound:



When door unlocks green light turns on:



Materials Used:-

1)Arduino uno:

The Arduino UNO microcontroller serves as the brain of the system, controlling the operations and interactions between various components.

2)Relay Module:

The relay module is used to control the solenoid lock. It acts as a switch, allowing the Arduino to control high-power devices like the lock.

3)RFID Sensor:

The RFID sensor detects RFID cards placed near it and reads their unique identifiers (UIDs), enabling the system to identify authorized individuals.

4)Solenoid Lock:

The solenoid lock is an electromechanical locking mechanism that is controlled by the relay module. When activated, it locks or unlocks the door.

5)LED (Green and Red):

LEDs provide visual feedback to indicate the status of the access attempt. A green LED signifies access granted, while a red LED indicates access denied

6)Buzzer:

The buzzer provides an audible alert in case of unauthorized access attempts. It adds an additional layer of security by alerting nearby individuals to potential security breaches.

7)Breadboard:

The breadboard is used for prototyping and connecting various electronic components without the need for soldering.

8)Jumpers:

Jumpers are used to make electrical connections between components on the breadboard, facilitating the assembly and testing process.

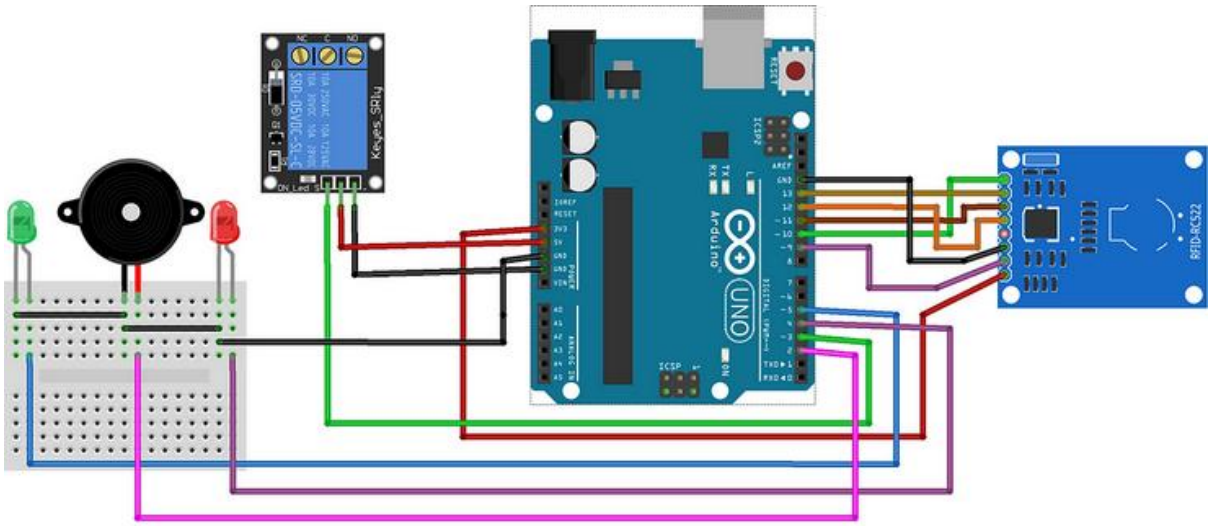
9)Power Supply (Adapter):

An adapter serves as the power supply for the entire system, providing the necessary voltage and current to operate the Arduino and other components reliably.

System Overview:

The system utilizes an Arduino UNO microcontroller as the main processing unit. The RFID sensor (MFRC522) detects RFID cards placed near it and reads their unique identifiers (UIDs). These UIDs are compared with predefined authorized IDs stored in the code. If a match is found, access is granted by activating a relay module, which in turn controls the solenoid lock mechanism. Additionally, visual feedback is provided through LEDs (green for access granted, red for access denied) and an audible alert is triggered using a buzzer in case of unauthorized access attempts.

Wiring Diagram:



Code:

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

#define SS_PIN 10
#define RST_PIN 9
#define LED_G 5 //define green LED pin
#define LED_R 4 //define red LED
#define RELAY 3 //relay pin
#define BUZZER 2 //buzzer pin
#define ACCESS_DELAY 2000
#define DENIED_DELAY 1000
MFRC522 mfrc522(SS_PIN, RST_PIN);   // Create MFRC522 instance.

void setup()
{
  Serial.begin(9600);   // Initiate a serial communication
  SPI.begin();          // Initiate  SPI bus
  mfrc522.PCD_Init();   // Initiate MFRC522
  pinMode(LED_G, OUTPUT);
  pinMode(LED_R, OUTPUT);
  pinMode(RELAY, OUTPUT);
  pinMode(BUZZER, OUTPUT);
  noTone(BUZZER);
  digitalWrite(RELAY, LOW);
  Serial.println("Put your card to the reader...");
  Serial.println();

}
```

```
void loop()
{
  // Look for new cards
  if ( ! mfrc522.PICC_IsNewCardPresent())
  {
    return;
  }
  // Select one of the cards
  if ( ! mfrc522.PICC_ReadCardSerial())
  {
    return;
  }
  //Show UID on serial monitor
  Serial.print("UID tag :");
  String content= "";
  byte letter;
  for (byte i = 0; i < mfrc522.uid.size; i++)
  {
     Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");
     Serial.print(mfrc522.uid.uidByte[i], HEX);
     content.concat(String(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : "
"));
     content.concat(String(mfrc522.uid.uidByte[i], HEX));
  }
  Serial.println();
  Serial.print("Message : ");
  content.toUpperCase();
  if (content.substring(1) == "83 23 38 BB") //change here the UID of
the card/cards that you want to give access
  {
    Serial.println("Authorized access");
    Serial.println();
    delay(500);
```

```
    digitalWrite(RELAY, HIGH);
    digitalWrite(LED_G, HIGH);
    delay(ACCESS_DELAY);
    digitalWrite(RELAY, LOW);
    digitalWrite(LED_G, LOW);
  }

 else   {
    Serial.println(" Access denied");
    digitalWrite(LED_R, HIGH);
    tone(BUZZER, 300);
    delay(DENIED_DELAY);
    digitalWrite(LED_R, LOW);
    noTone(BUZZER);
  }
}
```

Explanation:

The Arduino sketch initializes communication with the RFID sensor and defines pin configurations for LEDs, relay, and buzzer. In the `setup()` function, serial communication is initiated, and pin modes are set. The program then enters the `loop()` function, where it continuously checks for the presence of new RFID cards. If a card is detected, its UID is read and compared with the authorized IDs. If the UID matches an authorized ID, access is granted, and the relay is activated to unlock the door. Otherwise, access is denied, and visual/audio alerts are triggered.

Conclusion:

The Door Security Lock System provides a reliable and efficient means of controlling access to a door using RFID technology. It offers a balance of security and convenience, allowing authorized individuals seamless entry while maintaining the integrity of the secured area. Further enhancements can be made to the system, such as adding a database for storing authorized IDs remotely or integrating with a smartphone application for remote access control.