Porte Connectée

Portail de garage automobile

Al Shidi Tahara, Rahali Nioir, Laamari Ilaf

Introduction

Purpose of the Project:

The primary purpose of this project is to design and implement an automated gate system that enhances security and convenience for vehicle access. By integrating multiple technologies such as RFID, servo motors, and OLED displays, the system aims to provide a seamless and secure method for authorised vehicles to enter restricted areas.

This project not only focuses on improving security but also aims to streamline the process of vehicle entry, reducing the need for manual intervention and enhancing overall efficiency. The combination of sensors and actuators demonstrates the potential of integrating various technologies to create smart and automated systems.

This project may vary in size and complexity depending on the type of portal and desired features

Components

- Arduino Uno
- RFID Module
- Servo Motor (SG90)
- LCD Display (SSD1306)
- Breadboard and Jumper Wires

RFID

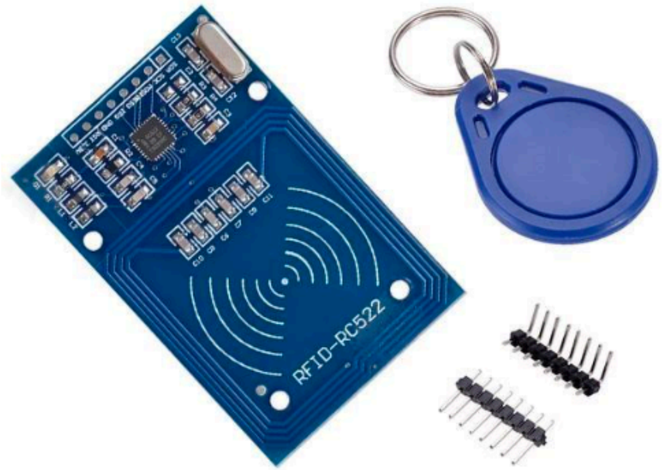
The **RFID** (*Radio Frequency Identification*) module is a critical component of our automated gate system. It is used to read unique identification data stored in RFID tags or cards. These tags contain a small chip and antenna, which allow them to communicate with the RFID reader using radio waves.

Key Components:

- RFID Reader: the hardware module that communicates with RFID tags.
- RFID Tags/Cards: contains the unique identification data that the RFID reader will read.

How RFID Works:

1. **Detection:** When an RFID tag comes within the reader's range, the reader emits a signal to power the tag.
2. **Communication:** The tag uses this signal to send its unique ID back to the reader.
3. **Authentication:** The reader processes the ID and sends it to the Arduino for verification against stored authorized IDs.



Servo-Motor

In our automated gate system, the servo motor plays a crucial role in physically opening and closing the gate. It provides the necessary torque and precision to move the gate to the desired position based on the commands received from the Arduino.

How the Servo Motor Controls the Gate:

The servo motor receives a PWM signal from the Arduino.

The duration of the pulse determines the angle to which the servo motor will rotate.

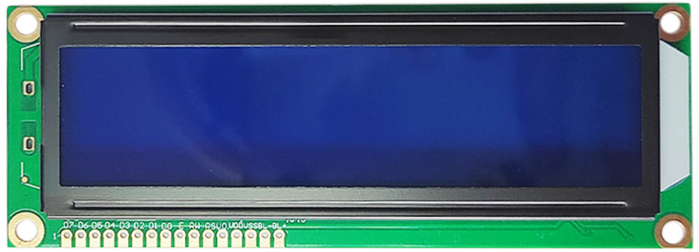
Opening the Gate:

When an authorised RFID card is detected, the Arduino sends a PWM signal to the servo motor to rotate to 90 degrees to open the gate. The motor moves the gate to the open position, allowing the vehicle to pass through.

Closing the Gate:

After a specified delay (5 seconds), the Arduino sends another PWM signal to the servo motor to return to the initial position (0 degrees). The motor moves the gate back to the closed position, securing the entry point.

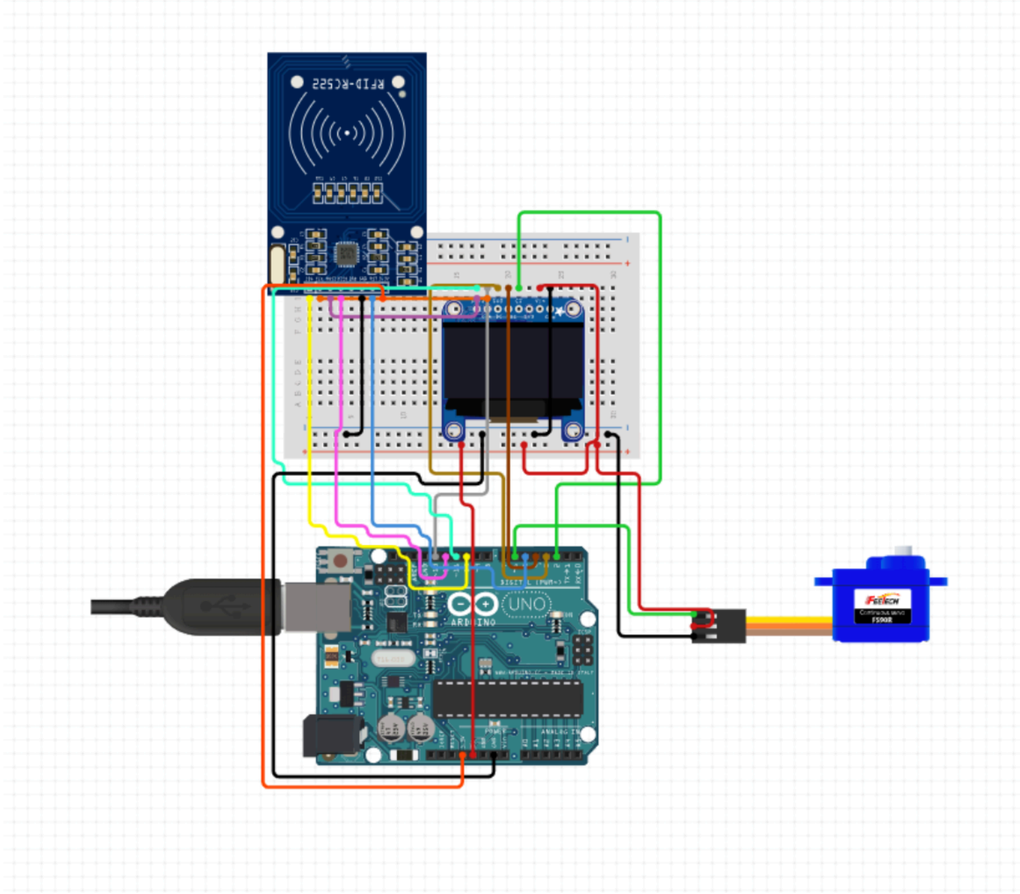
OLED Display



The primary function of the OLED display in our automated gate system is to provide real-time feedback to the user It displays the outcome of the RFID card scanning process. The OLED display used: SSD1306 model (a monocolor, 0.96-inch display with 128×64 pixels)

- If the presented RFID card is recognized as authorised, the OLED displays "Access Granted”
- If the RFID card is not recognized or is unauthorised, the OLED displays "Access Denied,"

Block Diagram



Code Implementation

```
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>
#include <SPI.h>
#include <MFRC522.h>
#include <Servo.h>

// Define RFID pins
#define RST_PIN 9
#define SS_PIN  10

// Define OLED screen dimensions and reset pin, if dealing with a screen in a different size then edit the height and width, obviously
#define SCREEN_WIDTH 128
#define SCREEN_HEIGHT 64
#define OLED_RESET -1

// Initialize the SSD1306 display with I2C address 0x3C
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, OLED_RESET);

// Initialize the MFRC522 RFID module
MFRC522 mfrc522(SS_PIN, RST_PIN);

// Define a structure to hold RFID card data and names
struct RFIDCard {
  byte uid[4];  // RFID card UID acquired through the dumpinfo example from the MFRC522 Librairy
  char name[20];  // Name associated with the RFID card, up to 20 characters ( Basically the card holder that will be displayed on the
};

// Define your RFID card data here
RFIDCard cards[] = {
  {{0x01, 0x23, 0x45, 0x67}, "Tahrah"},  // Example card 1
  {{0x89, 0xAB, 0xCD, 0xEF}, "Niwar"},    // Example card 2
  // obviously more cards/users can be added if needed
};
```

Code Language Used: C++

Testing and Results

Github: https://github.com/KazuInTheStu/RFID-Door-Lock-with-LCD/tree/main?tab=readme-ov-file

Challenges and Solutions & Future Improvements

Conclusion

The primary objective of this project was to design and implement an automated gate system that enhances security and convenience for vehicle access. By integrating various technologies such as RFID, servo motor, and OLED display, we successfully created a system that efficiently controls gate access based on authorised RFID cards. The system ensures secure and automated gate operations.

Thank you!