

# Project -B1

## AUTO DOOR LIGHTING

### Concept:

A Smart Central Car Door Opening System using servo motors for smooth, controlled door operation.

The driver can open all doors via a central control screen, while each door also has an emergency open button. LED strips glow during door movement for safety visibility.



# Introduction

This project uses an Arduino UNO to control servo motors that open and close car doors.

Each door is equipped with an LED strip that lights up during door movement, warning nearby pedestrians and vehicles.

The system can be triggered from a central touchscreen (or button) and also has emergency door buttons for individual control.

## Components Required

### Electronics components

- # Arduino UNO – 1×
- # Servo motors (metal gear,  $\geq 180^\circ$  rotation) – 4×
- # LED strips (12V automotive) – 4×
- # NPN transistors (TIP122) or MOSFETs – 4× (for LED control)
- # Resistors ( $220\Omega$ – $1k\Omega$ ) – 4×
- # Push buttons – 4× (for emergency open)
- # 12V-to-5V DC converter for Arduino
- # Jumper wires, breadboard, and connectors
- # Power
- # Car's 12V battery (fused)



## Step-by-Step Connection

### 1. Power

Car's 12V battery → 12V-to-5V converter → Arduino UNO.

Servos powered via 5V supply (not directly from Arduino 5V pin to avoid overcurrent).

### 2. Servos (Doors)

Servo signal pins to Arduino digital pins (e.g., pins 3, 5, 6, 9).

Servo Vcc to 5V external supply, GND common with Arduino.

### 3. LED Strips

+12V from battery to LED strip + terminal.

LED strip – terminal to transistor collector.

Transistor emitter to GND.

Transistor base to Arduino pin via resistor.

#### 4. **Push Buttons**

One side to Arduino digital pin, other side to GND.

Use INPUT\_PULLUP so pressed = LOW.

#### 5. **Central Control**

Can be simulated with one main push button, or use a touchscreen module.

## **Arduino UNO Code (Servo + LED)**

Arduino code:

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

```
// Servo objects
```

```
Servo servoFL, servoFR, servoRL, servoRR;
```

```
// Servo pins
```

```
#define SERVO_FL 3
```

```
#define SERVO_FR 5
```

```
#define SERVO_RL 6
```

```
#define SERVO_RR 9
```

```
// LED pins
```

```
#define LED_FL 10
```

```
#define LED_FR 11
#define LED_RL 12
#define LED_RR 13
// Buttons
#define BTN_FL A0
#define BTN_FR A1
#define BTN_RL A2
#define BTN_RR A3
void setup() {
    // Attach servos
    servoFL.attach(SERVO_FL);
    servoFR.attach(SERVO_FR);
    servoRL.attach(SERVO_RL);
    servoRR.attach(SERVO_RR);
    // Set LEDs
    pinMode(LED_FL, OUTPUT);
    pinMode(LED_FR, OUTPUT);
    pinMode(LED_RL, OUTPUT);
    pinMode(LED_RR, OUTPUT);
    // Set buttons
    pinMode(BTN_FL, INPUT_PULLUP);
    pinMode(BTN_FR, INPUT_PULLUP);
    pinMode(BTN_RL, INPUT_PULLUP);
    pinMode(BTN_RR, INPUT_PULLUP);
```

```
// Initial door closed position
closeAllDoors();
}

void loop() {
    // Check emergency buttons
    if (digitalRead(BTN_FL) == LOW) openDoor(servoFL, LED_FL);
    if (digitalRead(BTN_FR) == LOW) openDoor(servoFR, LED_FR);
    if (digitalRead(BTN_RL) == LOW) openDoor(servoRL, LED_RL);
    if (digitalRead(BTN_RR) == LOW) openDoor(servoRR, LED_RR);

    // Example: open all doors with one trigger (simulate with a
    condition)

    // openAllDoors();
}
```

```
void openDoor(Servo &doorServo, int ledPin) {
    digitalWrite(ledPin, HIGH); // LED ON
    for (int pos = 0; pos <= 90; pos++) { // Rotate 0° to 90°
        doorServo.write(pos);
        delay(15);
    }
    delay(2000); // Keep open for 2 sec
    for (int pos = 90; pos >= 0; pos--) { // Close back
        doorServo.write(pos);
        delay(15);
    }
}
```

```
}  
digitalWrite(ledPin, LOW); // LED OFF  
}  
void openAllDoors() {  
    openDoor(servoFL, LED_FL);  
    openDoor(servoFR, LED_FR);  
    openDoor(servoRL, LED_RL);  
    openDoor(servoRR, LED_RR);  
}  
void closeAllDoors() {  
    servoFL.write(0);  
    servoFR.write(0);  
    servoRL.write(0);  
    servoRR.write(0);  
}
```



## Conclusion

This project demonstrates a safe, modern, and visually appealing way to open car doors using servo motors and LED strips. The Arduino UNO provides simple yet powerful control, making it suitable for both new vehicles and retrofits.



## THE END



