PRACTICAL 3 : Traffic Signal

Aim : To simulate a traffic signal system using LEDs and Arduino.

Overview :

This project simulates a real-world traffic light system using LEDs and Arduino. It introduces concepts of sequential control, timing and real-time decision-making, which are essential in IoT-based automation systems. The practical helps in understanding how microcontrollers manage multi-step processes.

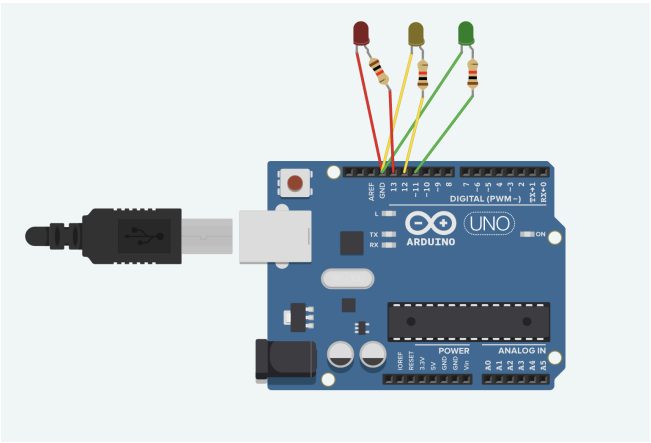
Materials Required :

- Arduino Uno R3
- 3 x LED (Red, Yellow, Green)
- 3 x 1kΩ Resistor
- Jumper Wires
- Arduino IDE (Installed on your Computer)

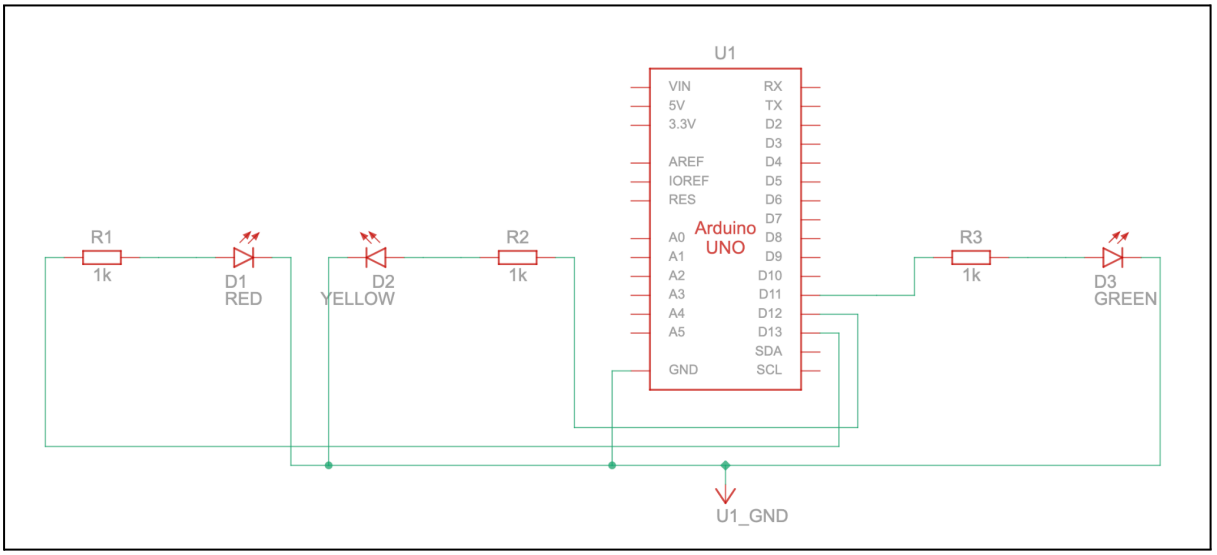
Circuit Connection and Steps :

1. **Connect the LEDs to the Arduino :**
    - Insert the three LEDs (Red, Yellow, Green) into the breadboard.
    - Connect the anode (long leg) of each LED to the following Arduino pins :
        - Red LED : Pin 13
        - Yellow LED : Pin 12
        - Green LED : Pin 11
    - Connect the cathode (short leg) of each LED to the ground (GND) pin on the Arduino through a 1kΩ resistor.
2. **Set up the Arduino environment:**
    - Open the Arduino IDE on your computer.
    - Select the correct board and port from the "Tools" menu.

Circuit Diagram :



Schematic Diagram :



Code :

```
// C++
// Define the pin connections for the LEDs

int redPin = 13;
int yellowPin = 12;
int greenPin = 11;

// Setup function runs once when the program starts
void setup() {
  // Set the LED pins as OUTPUT
  pinMode(redPin, OUTPUT);
  pinMode(yellowPin, OUTPUT);
  pinMode(greenPin, OUTPUT);
}

// Loop function runs repeatedly
void loop() {
  // Green light for 5 seconds
  digitalWrite(greenPin, HIGH); // Turn on Green LED
  digitalWrite(yellowPin, LOW); // Turn off Yellow LED
  digitalWrite(redPin, LOW);  // Turn off Red LED
  delay(5000); // Wait for 5 seconds
  // Turn off Yellow LED


  // Yellow light for 2 seconds
  digitalWrite(greenPin, LOW); // Turn off Green LED
  digitalWrite(yellowPin, HIGH); // Turn on Yellow LED
```

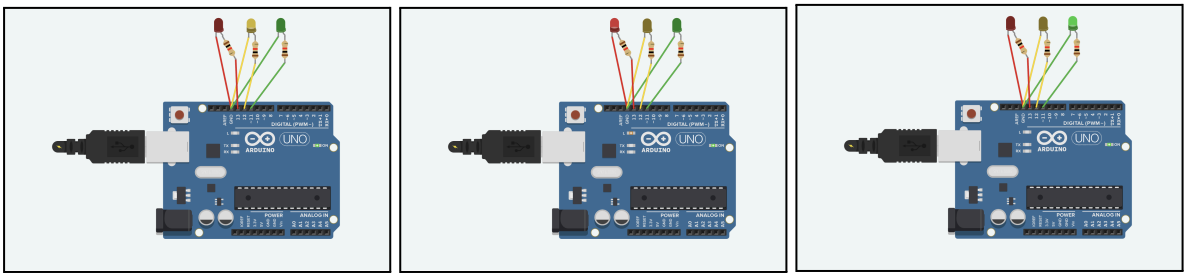
```
  digitalWrite(redPin, LOW); // Turn off Red LED
  delay(2000); // Wait for 2 seconds

  // Red light for 5 seconds
  digitalWrite(greenPin, LOW);   // Turn off Green LED
  digitalWrite(yellowPin, LOW);   // Turn off Yellow LED
  digitalWrite(redPin, HIGH);   // Turn on Red LED
  delay(5000); // Wait for 5 seconds
}
```

Results :

The traffic signal system will cycle through the following pattern :

- The Green LED will light up for 5 seconds (allowing traffic to go).
- The Yellow LED will light up for 2 seconds (indicating the transition from Green to Red).
- The Red LED will light up for 5 seconds (indicating a stop for traffic). This cycle will repeat indefinitely, simulating a basic traffic signal system



Conclusion :

The Traffic Signal project successfully simulates real-world traffic light control using Arduino. It demonstrates the concept of sequential execution, timing control and LED management. This experiment provides insight into automation in smart city applications and real-time embedded system design.