Arduino Project: RGB LED Control Using Potentiometers

Objective:

Use three potentiometers to control the intensity of Red, Green, and Blue in an RGB LED, allowing dynamic color mixing.

Components Required:

- Arduino Uno
- RGB LED (Common Cathode preferred)
- 3 × 220Ω Resistors
- 3 × 10kΩ Potentiometers
- Jumper wires

Learning Goal:

- Learn how to manipulate colors using PWM (Pulse Width Modulation). - Understand how multiple analog inputs (potentiometers) can control multiple outputs.

Working Principle:

1. An RGB LED has three internal LEDs: Red, Green, Blue.
2. Each color is controlled independently using PWM on Arduino pins.
3. Each potentiometer changes the voltage input → Arduino reads it as an analog value (0–1023).
4. The analog value is mapped to PWM output (0–255) using the map() function.
5. analogWrite() sets the brightness of each LED color.
6. Rotating the potentiometers dynamically changes the color of the RGB LED in real-time.

Algorithm:

1. Start
2. Initialize Arduino pins for LED output and potentiometer input.
3. In the loop:
   - Read all three potentiometers (analogRead(A0, A1, A2))
   - Map values from 0–1023 to 0–255 for PWM
   - Output PWM values to RGB LED pins (analogWrite())
4. Repeat continuously for real-time color control.

Arduino Code:

```
// Potentiometer pins
int potR = A0;
int potG = A1;
int potB = A2;

// RGB LED pins (PWM)
int ledR = 9;
int ledG = 10;
int ledB = 11;

void setup() {
  pinMode(ledR, OUTPUT);
  pinMode(ledG, OUTPUT);
  pinMode(ledB, OUTPUT);
}
void loop() {
```

```
  int valR = analogRead(potR);
  int valG = analogRead(potG);
  int valB = analogRead(potB);

  int redValue   = map(valR, 0, 1023, 0, 255);
  int greenValue = map(valG, 0, 1023, 0, 255);
  int blueValue  = map(valB, 0, 1023, 0, 255);

  analogWrite(ledR, redValue);
  analogWrite(ledG, greenValue);
  analogWrite(ledB, blueValue);
}
```

Circuit Connections:

```
Connections:
- Potentiometer Red pin → A0
- Potentiometer Green pin → A1
- Potentiometer Blue pin → A2
- RGB LED Red pin → D9 (through 220Ω resistor)
- RGB LED Green pin → D10 (through 220Ω resistor)
- RGB LED Blue pin → D11 (through 220Ω resistor)
- RGB LED Common Cathode → GND
- Potentiometers VCC → 5V
- Potentiometers GND → GND
```