

Kennedy Anukam
CPE 406
Assignment 7
April 17, 2021

Assignment Description:

In the first portion of the lab, I will complete project 5.1 described in the Freenove tutorial as is. In this portion of the lab, I will wire the multicolored LED circuit. The circuit includes a RGB LED, three resistors, and the Raspberry Pi and breadboard. I will run the code provided by Freenove to get the desired output of the multicolored LED. In the second part of the lab, I will make a modification to the Freenove code to complete a custom functionality. With the modification, the code shall repeatedly cycle through 5 colors for 5 seconds each and stop for 10 seconds after the final color. What I hope to learn from this lab is how exactly a RGB LED works and how it can be controlled through code

Problems Encountered:

In this lab, a problem I encountered was a slight mistake in the circuit wiring. Initially, I thought my LED was common cathode, but it was common anode. I fixed this problem by rereading the Freenove guide and finding out the LED provided in the kit is common anode. I connected it to VCC instead of GND and that fixed the problem,

Lessons Learned:

A lesson I learned from this lab is how a RGB LED exactly works. I found out that the duty cycle of the pins can be altered in order to produce a completely new color. I learned that the range of colors that can be created with a three 8 bit PWM is $2^8 * 2^8 * 2^8$.

Description of Completed Lab:

Project 5.1

In this part of the lab, I wired the circuit and ran the code to get the output of the multicolored LED. The colors that are outputted are completely random as three random number functions are being utilized.

Circuit Wiring

Figure 1 shows the snippet of the circuit containing the RGB-LED.

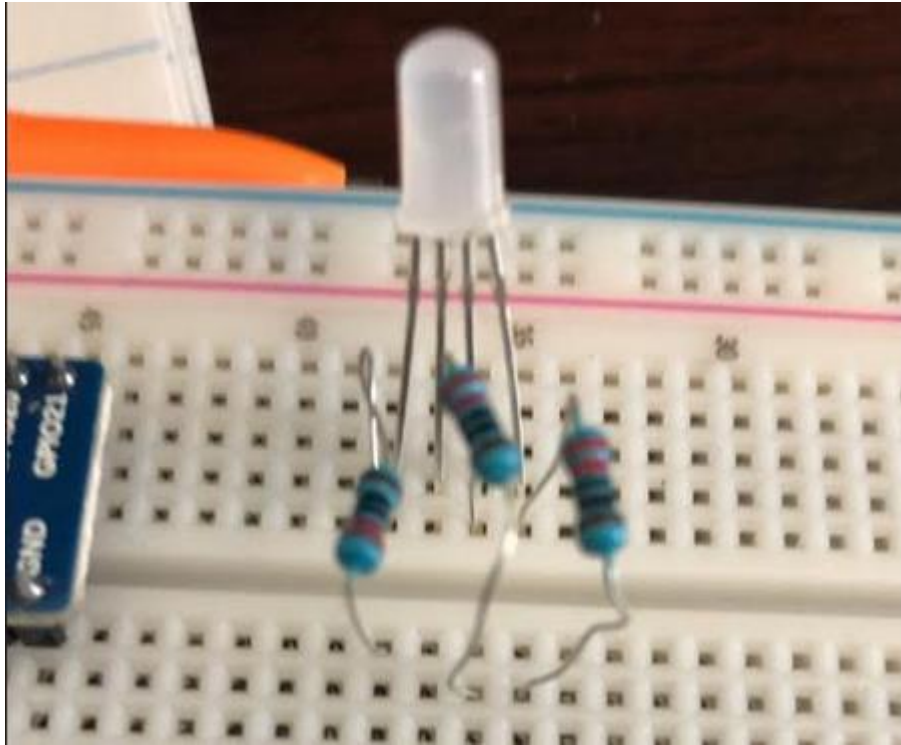


Figure 1: A subsection of the circuit containing the RGB-LED. Three 220 Ohm resistor are utilized which connect to GPIO pins..

Figure 2 shows the entire circuit with all of the wiring completed.

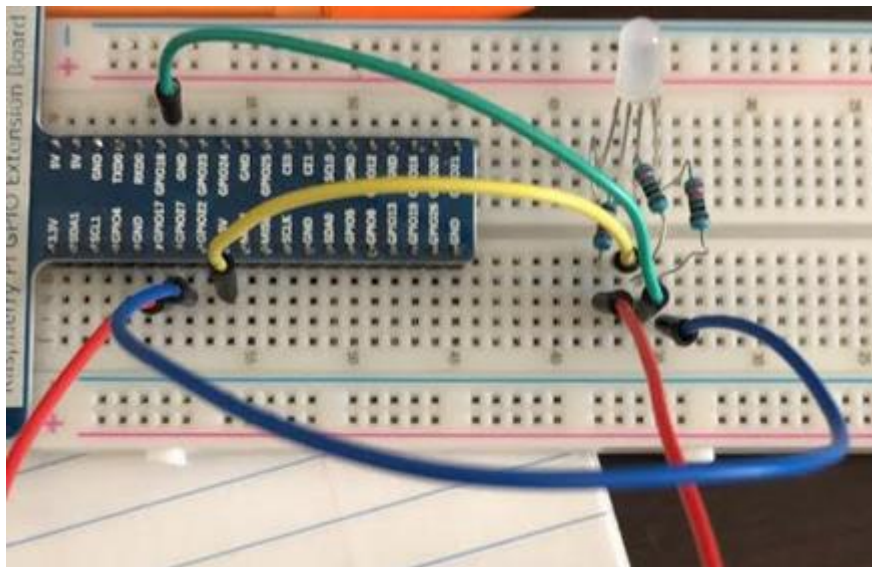


Figure 2: The entire circuit for the RGB-LED.

Code & Results

```
#!/usr/bin/env python3
#####
# Filename      : ColorfulLED.py
# Description   : Random color change ColorfulLED
# Author        : www.freenove.com
# modification  : 2019/12/27
#####
# modified by K. Anukam 2021/04/17 rev 1.1
import RPi.GPIO as GPIO
import time
import random

pins = [11, 12, 13] # define the pins for R:11,G:12,B:13

def setup():
    global pwmRed, pwmGreen, pwmBlue
    GPIO.setmode(GPIO.BOARD) # use PHYSICAL GPIO Numbering
    GPIO.setup(pins, GPIO.OUT) # set RGBLED pins to OUTPUT mode
    GPIO.output(pins, GPIO.HIGH) # make RGBLED pins output HIGH level
    pwmRed = GPIO.PWM(pins[0], 2000) # set PWM Frequency to 2kHz
    pwmGreen = GPIO.PWM(pins[1], 2000) # set PWM Frequency to 2kHz
    pwmBlue = GPIO.PWM(pins[2], 2000) # set PWM Frequency to 2kHz
    pwmRed.start(0) # set initial Duty Cycle to 0
    pwmGreen.start(0)
    pwmBlue.start(0)

def setColor(r_val, g_val, b_val): # change duty cycle for three pins to
r_val,g_val,b_val
    pwmRed.ChangeDutyCycle(r_val) # change pwmRed duty cycle to r_val
    pwmGreen.ChangeDutyCycle(g_val)
    pwmBlue.ChangeDutyCycle(b_val)

def loop():
    print("Kennedy Anukam AS07")
    while True:
        r = random.randint(0, 100) # get a random in (0,100)
        g = random.randint(0, 100)
        b = random.randint(0, 100)
        setColor(r, g, b) # set random as a duty cycle value
        print('r=%d, g=%d, b=%d ' % (r, g, b))
        time.sleep(1)

def destroy():
    pwmRed.stop()
    pwmGreen.stop()
    pwmBlue.stop()
    GPIO.cleanup()
```

```
if __name__ == '__main__': # Program entrance
    print('Program is starting ... ')
    setup()
    try:
        loop()
    except KeyboardInterrupt: # Press ctrl-c to end the program.
        destroy()
```

[VIDEO](#)

Project 5.1 Modified Code

In this part of the lab, I modified the code to loop over 5 colors for 5 seconds. After the final color, the LED is turned off for ten seconds and the functionality continues. I completed this by storing the three value colors in an array of tuples and looping through the colors.

Code & Results

```
#!/usr/bin/env python3
#####
# Filename      : ColorfulLED.py
# Description   : Random color change ColorfulLED
# Author        : www.freenove.com
# modification  : 2019/12/27
#####
# modified by K. Anukam 2021/04/17 rev 1.2
import RPi.GPIO as GPIO
import time
import random

pins = [11, 12, 13] # define the pins for R:11,G:12,B:13

def setup():
    global pwmRed, pwmGreen, pwmBlue
    GPIO.setmode(GPIO.BOARD) # use PHYSICAL GPIO Numbering
    GPIO.setup(pins, GPIO.OUT) # set RGBLED pins to OUTPUT mode
    GPIO.output(pins, GPIO.HIGH) # make RGBLED pins output HIGH level
    pwmRed = GPIO.PWM(pins[0], 2000) # set PWM Frequency to 2kHz
    pwmGreen = GPIO.PWM(pins[1], 2000) # set PWM Frequency to 2kHz
    pwmBlue = GPIO.PWM(pins[2], 2000) # set PWM Frequency to 2kHz
    pwmRed.start(0) # set initial Duty Cycle to 0
    pwmGreen.start(0)
    pwmBlue.start(0)

def setColor(r_val, g_val, b_val): # change duty cycle for three pins to
r_val,g_val,b_val
    pwmRed.ChangeDutyCycle(r_val) # change pwmRed duty cycle to r_val
    pwmGreen.ChangeDutyCycle(g_val)
    pwmBlue.ChangeDutyCycle(b_val)

def loop():
    print("Kennedy Anukam AS07")
    colors = [(72, 99, 49), (48, 60, 64), (96, 83, 54), (17, 47, 84), (81, 95,
91)]
    while True:
        setup()
        for color in colors:
            r, g, b = color # Destructure Tuple
```

```
        setColor(r, g, b)
        print('r=%d, g=%d, b=%d ' % (r, g, b))
        time.sleep(5)
    destroy()
    time.sleep(10)

def destroy():
    pwmRed.stop()
    pwmGreen.stop()
    pwmBlue.stop()
    GPIO.cleanup()

if __name__ == '__main__': # Program entrance
    print('Program is starting ... ')
    try:
        loop()
    except KeyboardInterrupt: # Press ctrl-c to end the program.
        destroy()
```

[VIDEO](#)