

## Lab 2 Report

### Board and Circuit:



Fig. 1: Raspberry Pi w/ SG90 servo connected. ORANGE wire (PWM) connected to Pin 11 (GPIO17), RED wire (VCC) connected to Pin 2 (5V Power), BROWN wire (Ground) connected to Pin 6 (GND).

### Python Script:

```
import RPi.GPIO as GPIO
import time

# Set pin numbering to board style
GPIO.setmode(GPIO.BOARD)

# Pin 11 is PWM output pin @ 50 Hz
GPIO.setup(11, GPIO.OUT)
servo = GPIO.PWM(11, 50)

# Set the initial duty cycle to 1.5 ms (90 degrees)
servo.start(7.5)

try:
    while True:
        # Turn to 0 degrees (CCW stop) and sleep 3 seconds
        servo.ChangeDutyCycle(2.5)
        time.sleep(3)

        # Turn to 180 degrees (CW stop) and sleep 3 seconds
        servo.ChangeDutyCycle(12.5)
        time.sleep(3)

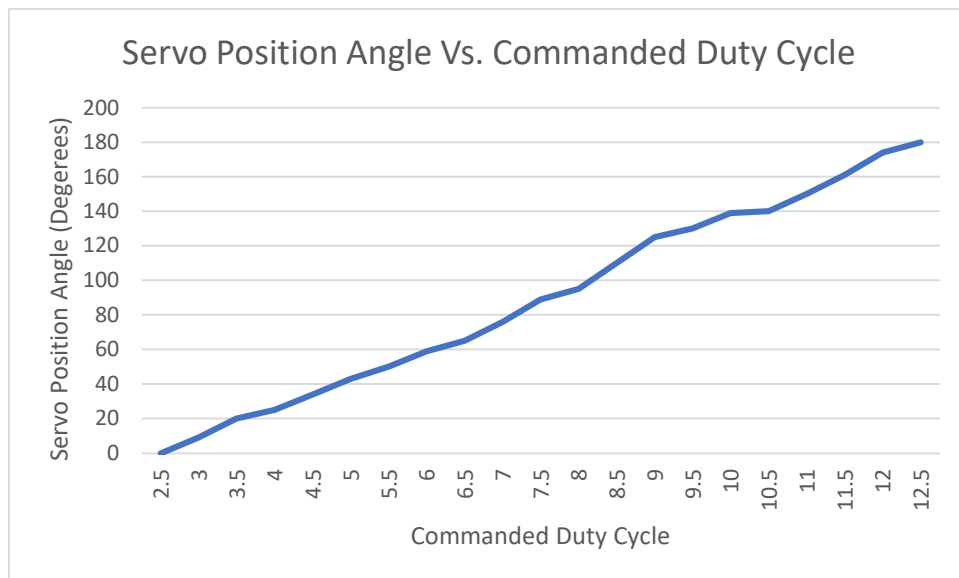
        # Sweep from 180 to 0 degrees w/ 1 second in between steps
        i = 12.5;
        while (i > 2.5):
            i -= 1
            servo.ChangeDutyCycle(i)
            time.sleep(1)

        # Sweep from 0 to 180 degrees w/ 1 second in between steps
        while (i < 12.5):
            i += 1
            servo.ChangeDutyCycle(i)
            time.sleep(1)

except KeyboardInterrupt:
    servo.stop()
    GPIO.cleanup()
```

**Servo Calibration Data:**

Command Duty Cycle	Position Angle
2.5	0
3	9
3.5	20
4	25
4.5	34
5	43
5.5	50
6	59
6.5	65
7	76
7.5	89
8	95
8.5	110
9	125
9.5	130
10	139
10.5	140
11	150
11.5	161
12	174
12.5	180



Is the calibration curve you generated linear?

- > The graph is, for the most part, linear. There exist some irregularities, but that can be mainly scraped off due to the lack-of-access to more precise measurement tools. There are some points on the servo that do not exactly match up with their respective duty cycles (e.g.  $0^\circ$  should be at duty cycle 2.5, but in reality, it's more like 2.4 or 2.6), but most were on track.

As a side note: instead of going by  $5^\circ$  like the lab document said, I went by 0.5 duty cycles per step, which is about  $9^\circ$  per step. Going by  $5^\circ$  would have required a repeating decimal for duty cycle steps, so some changes were made.