BRAC UNIVERSITY

Inspiring Excellence

CSE461 LAB
Introduction to Robotics
LAB 3

Topic: Introducing servo motor with
Raspberry Pi

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Description: In this lab, the concepts of duty cycle and pulse width modulation were used to introduce us to the subject of servo motors and how they work.It's crucial to understand the connector pinout of the servo motor's wire layout so that the Raspberry Pi can supply the necessary input power voltage (+V), ground and correctly indicate while making a connection. Three wires make up the pinout: an orange signal wire that delivers a PWM signal to operate the motor, a red power wire that powers the motor, and a brown ground wire that connects to the system's ground.Duty cycle works in the range of (5-10)%.In theory, the motor rotates 0 degrees, 90 degrees, and 180 degrees for duty cycles of 5%, 7.5% and 10% accordingly. All GPIO pins on the Raspberry pi hardware board can be used for software pulse-width modulation, or PWM. Each pin produces a square waveform with a configurable frequency and duty cycle when set for PWM.This experiment aimed to spin the servo motor to a desired position and gain an understanding of its operation. After connecting the Raspberry Pi to the servo motor and calibrating the output, we were able to generate an equation. The motor was then rotated to the angle that the user had entered by utilizing the equation.

Components:

- Raspberry Pi 4
- Servo Motor
- Jumper Wires
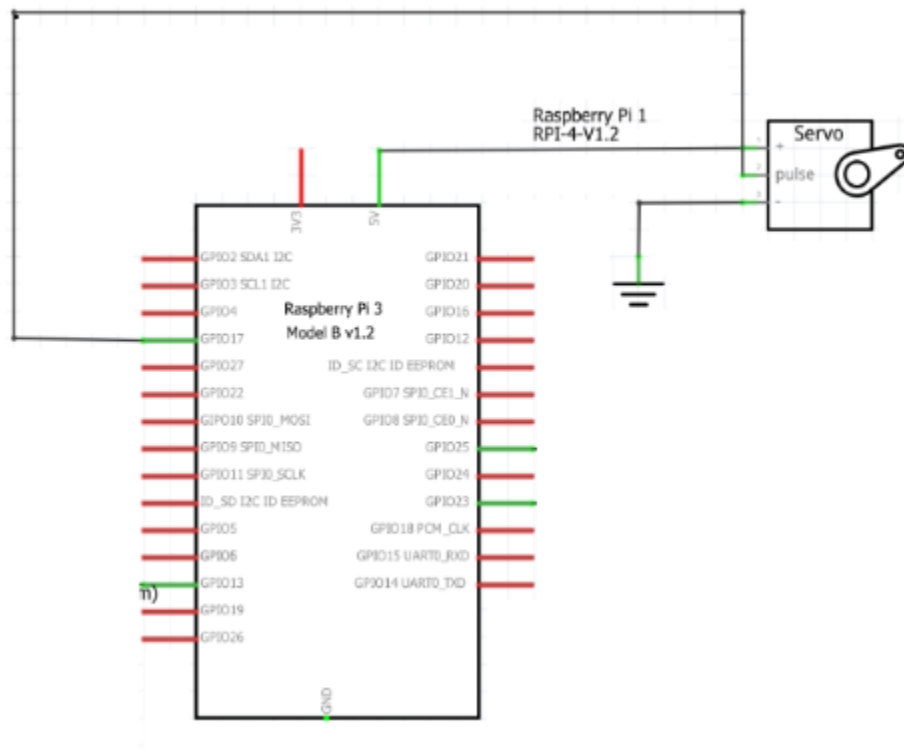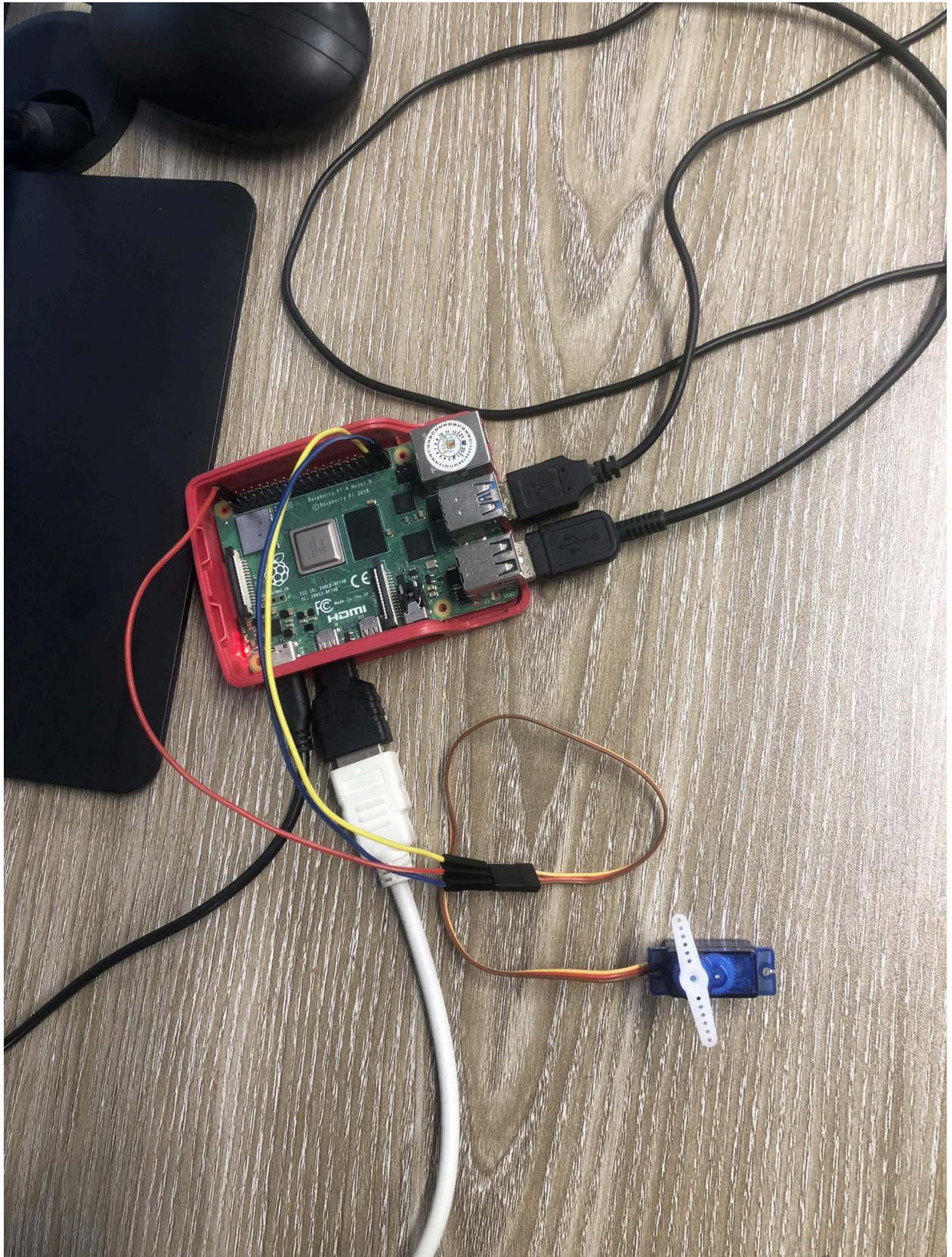- 32GB Pendrive
- Monitor,Keyboard

Circuit diagram:

Figure: Raspberry Pi connection with a servo motor

Circuit setup:

code:

```
import RPi.GPIO as GPIO
from time import sleep
GPIO.setmode(GPIO.BOARD)
GPIO.setup(37, GPIO.OUT)
pwm=GPIO.PWM(37, 50)
pwm.start(0)

pwm.ChangeDutyCycle(2)
sleep(3)

pwm.ChangeDutyCycle(13.1)
sleep(3)

x=int(input("Enter a value: "))
y=0.056*(1.11*x + 36)
print(y)

pwm.ChangeDutyCycle(y)
sleep(3)
pwm.stop()
GPIO.cleanup()
```

Discussion:

The purpose of this experiment is to understand how servo motors work. The servo motor is connected to a GPIO pin that can produce PWM output. In order to rotate the servo motor to 0° and 180°, we had to first calibrate it and determine the duty cycles needed. In our case the duty Cycle of 2 produced 0° and 13.1 produced 180°. After that, we created an equation using the y=mx+c formula and wrote the code for user input. Eventually, the motor rotated to that angle after being set.