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Section: 08

GROUP: 05

Course: Introduction to Robotics

Course Code: CSE461

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LAB 03: Introducing servo motor using along with push buttons and LEDs

with Raspberry Pi

Objective:

The objective of this lab report is to explore the mechanisms of servo motor with the help of Raspberry Pi,with the intention to learn about servo motors working mechanisms,duty cycle,controlling an LED with the help of push button using servo motors anglewise rotation and Raspberry Pi.We will conduct this experiment to get familiar with servo motors and how the GPIO pins of Raspberry Pi can be connected to servo motor for its working mechanism and controlling an LED button.

Equipment:

- ● Raspberry Pi 4
- ● Servo Motor
- ● LED
- ● A resistor of 220 ohms
- ● Push-button
- ● Connecting wires (female to male)

Experimental Setup:
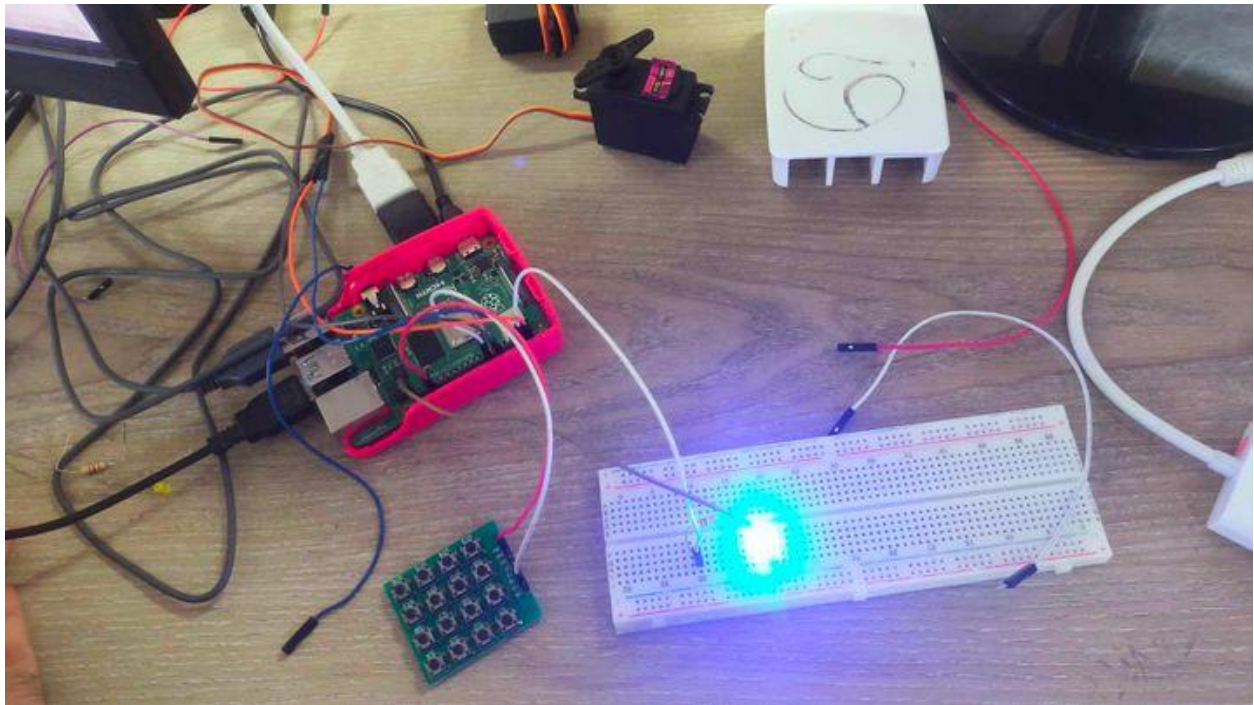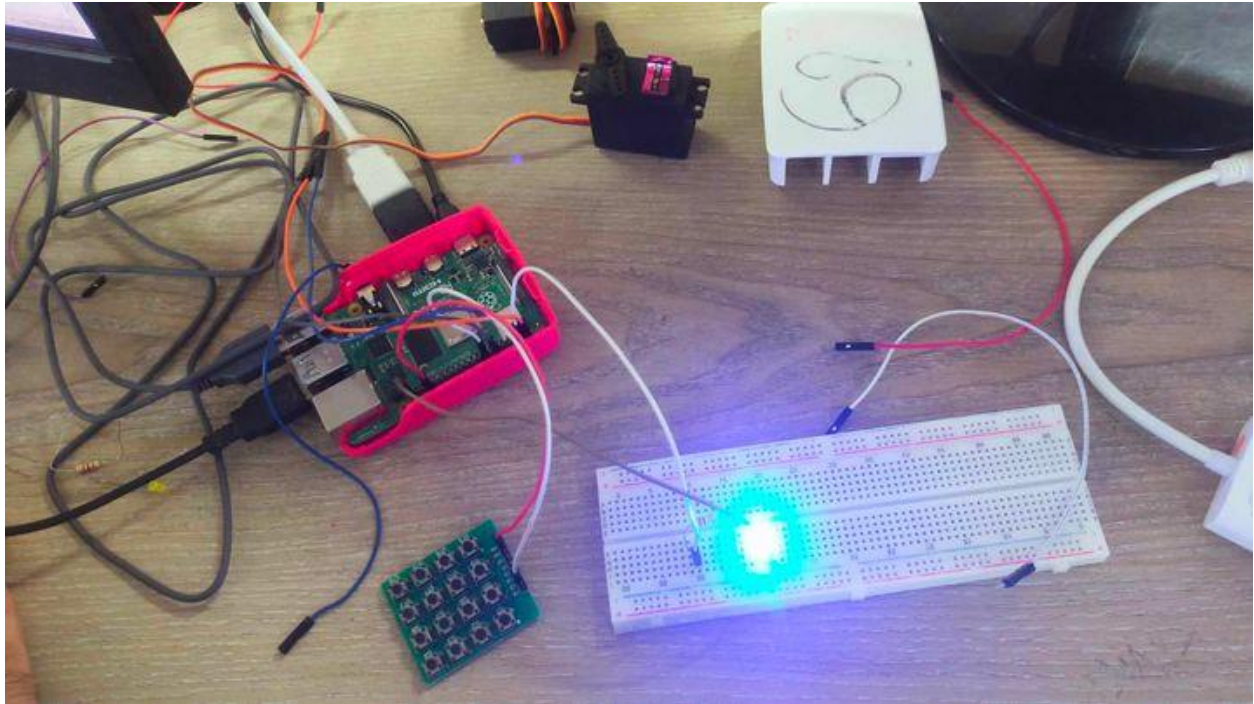
Explanation:

In this lab report, we aimed to explore the mechanisms of a servo motor using a Raspberry Pi, with the additional objective of controlling an LED using push buttons and

the servo motor's angle-wise rotation. The experiment was conducted in three segments. In the first segment, we directly connected the servo motor to the Raspberry Pi and observed its rotation to the left and right. In the second segment, we introduced LED and push buttons, successfully controlling the servo motor and LED simultaneously. However, we faced challenges initially, which were resolved by fixing the connections. Lastly, in the third segment, we used duty cycle control to rotate the servo motor.

Code:

```
from gpiozero.pins.pigpio import PiGPIOFactory
from gpiozero import Device, LED, Button, Servo, AngularServo
from time import sleep
button1= Button(27) #pin 13
button2= Button(22) #pin 15
led=LED(4) #pin 7

Device.pin_factory = PiGPIOFactory()

s = AngularServo(17,min_angle = 0, max_angle =
180,min_pulse_width=0.5/1000,max_pulse_width = 25/10000)

while True:
button1.wait_for_press()
s.angle=120# (120 degree to the left)
led.on()
sleep(1)
led.off()
#right
button2.wait_for_press()
s.angle=60 # 60 degree to the right
```

```
led.on()
sleep(1)
led.off()
```

Code with duty cycle control:

```
import RPi.GPIO as GPIO
from time import sleep
from gpiozero import Button
from gpiozero import LED
button1= Button(27)
button2= Button(22)
led1=LED(4)

GPIO.setmode(GPIO.BCM)
GPIO.setup(17,GPIO.OUT)
pwm=GPIO.PWM(17,50)
pwm.start(7) #center(90 degrees)

while True:
button1.wait_for_press()
pwm.ChangeDutyCycle(5.3) # (left)
led1.on()
sleep(1)
led1.off()

button2.wait_for_press()
pwm.ChangeDutyCycle(8.7) # right
led1.on()
sleep(1)
led1.off()
```

Results:

After finishing the setup, we were able to connect the servo motor and LED light to te Rasberry Pi successfully. Whenever the button was pressed the light would turn on and the servo motor would rotate to the given angle which was calculated through duty cycles. Then if we again push the button the light will turn on and the servo motor would rotate to the opposite angle.

Discussions:

Through the completion of this lab, we were able to understand the basic functions of the servo motor. Not only that, we got to know about the GPIO pins. One of the problems that arose was before we used the GPIO board but in this lab we used GPIO pins. So, we had some issues geeting used to knowing the pin numbers. As a result, our implementation took longer than anticipated.