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Inspiring Excellence

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Experiment No: 03

Group No: 02

Section: 07

Spring 2023

Name of the Experiment: Introducing servo motor usage along with push buttons and LEDs with Raspberry Pi

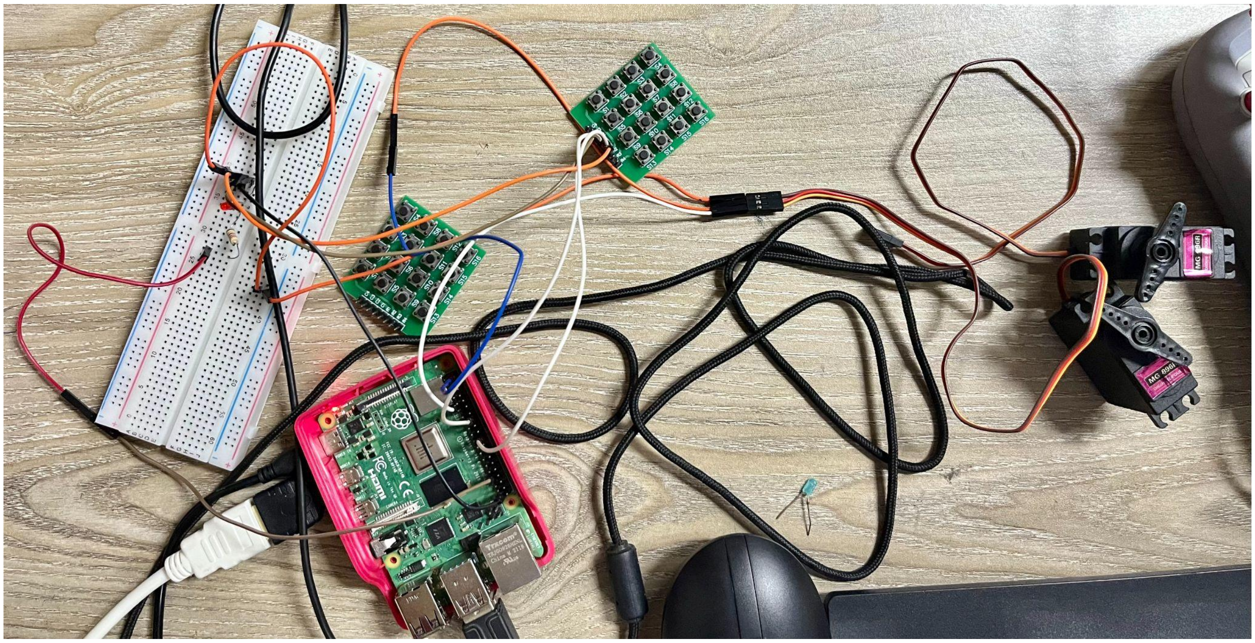
Objective:

This experiment aims to control the rotation of a servo motor using Raspberry Pi and push button. To detect the command of control, LED will be used too. Through this experiment, we will be able to program and manage the rotation of the motor which can be helpful in many types of manipulators.

Equipment:

1. Raspberry Pi
2. Servo Motor
3. LED
4. 220 Ohm Resistor
5. Push Button
6. Connecting Wires(Male/Female)
7. Monitor, Keyboard, and Mouse (Optional)

Experimental Setup:



Circuit design and Servo Motor

Code:

To start the pigpio daemon

```
sudo pigpiod
```

To stop the pigpio daemon

```
sudo killall pigpiod
```

```
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()
```

Result:

A servo motor can be used to control the position of a mechanical system, such as a robot arm or a camera gimbal, based on signals received from the Raspberry Pi. Push buttons can be used as input devices to trigger actions or change the servo motor's behavior, such as moving it to a different position or stopping its motion. LEDs can be used as output devices to provide visual feedback, such as indicating the status of the servo motor or the state of the system. Together, these components can be used to create a wide range of projects, from simple demonstrations of servo motor control to more complex robotic systems. The specific details of how these components are used will depend on the program or project we are creating.

Conclusion & Discussion:

The use of servo motors with push buttons and LEDs is particularly useful in robotics and automation applications. The ability to control the position and movement of the servo motors makes it possible to create complex and precise movements, while the use of push buttons and LEDs provides a means of interacting with the system and providing feedback to the user. One potential limitation of using servo motors with push buttons and LEDs is the need for precise timing and synchronization between the various components. This can be challenging to achieve without careful programming and design. Another consideration is the power requirements of the servo motors. Depending on the number and size of the motors, a separate power supply may be necessary to ensure reliable operation. It is also important to ensure that the power supply can provide sufficient current to the motors without overheating or damaging the components. Overall, the use of servo motors with push buttons and LEDs with a Raspberry Pi is a powerful combination that offers a wide range of possibilities for creating dynamic and interactive projects. With careful design and programming, it is possible to create complex and precise movements and interactions that can be used in a variety of applications.