CSE 461 : Introduction to Robotics

Project Proposal

Group Information

Lab Section: 09
Group Number: 03

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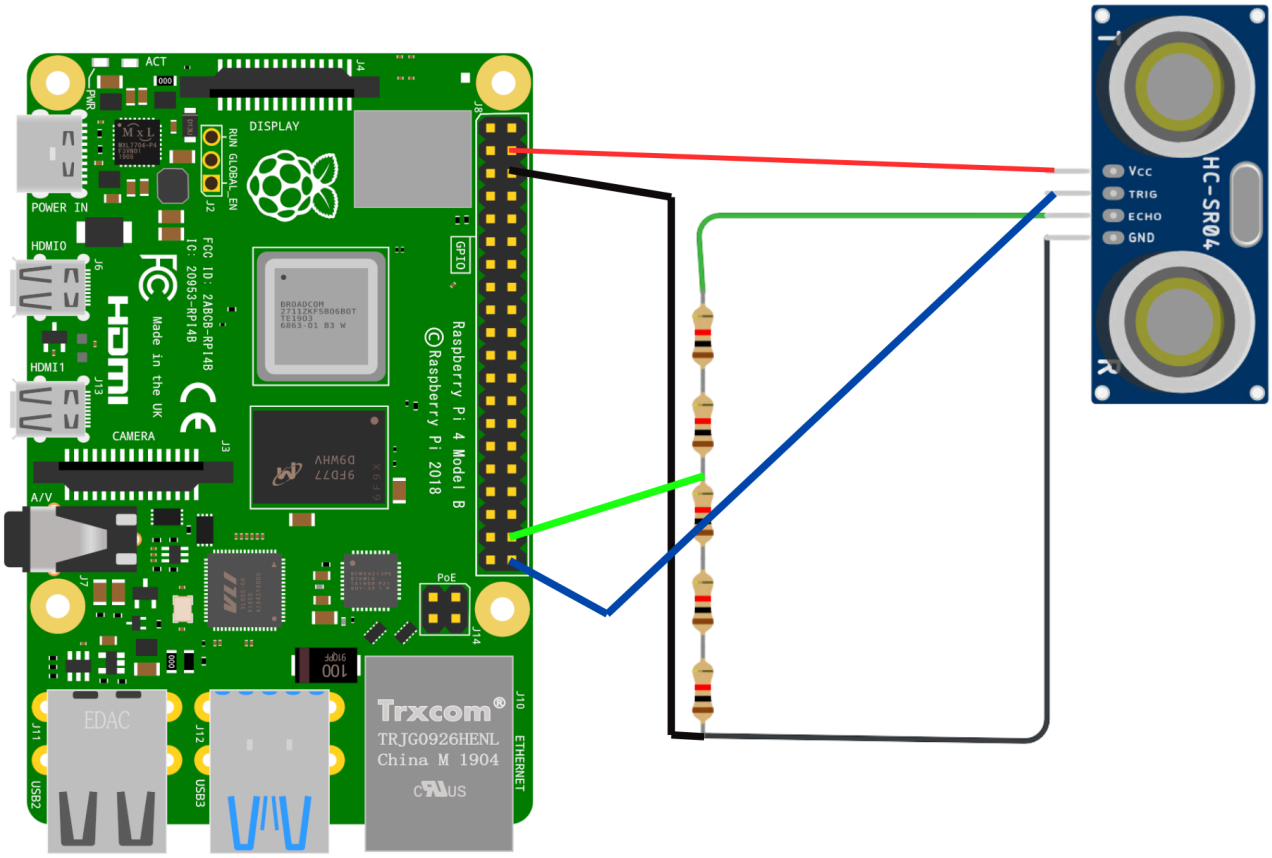
Group Members:**Task Description:**

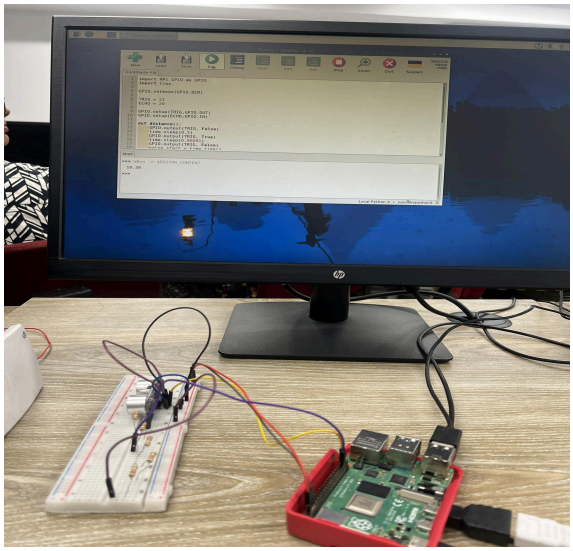
This report discusses how to measure distance using an ultrasonic sensor with Raspberry Pi. Ultrasonic sensors work by sending out sound waves and timing how long they take to bounce back. A Raspberry Pi is a small computer used for various tasks like programming and robotics. This lab demonstrates how to accurately measure distance by connecting an ultrasonic sensor to a Raspberry Pi.

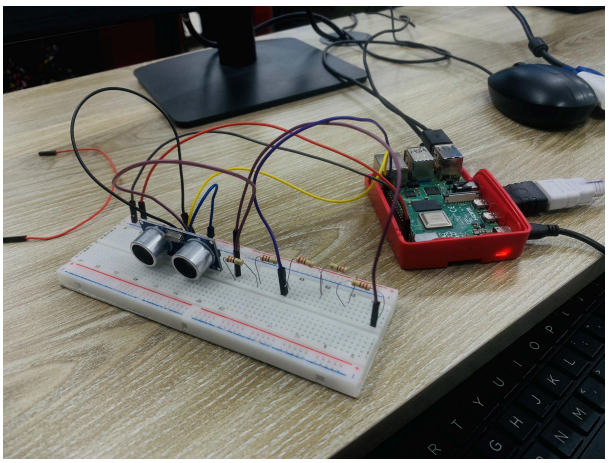
Components Used: Raspberry Pi , Ultrasonic Sensor (HC-SR04) ,Breadboard , Jumper Wires , 22 Ω resistor , MicroSD Card , USB Cable , Monitor, Keyboard and Mouse

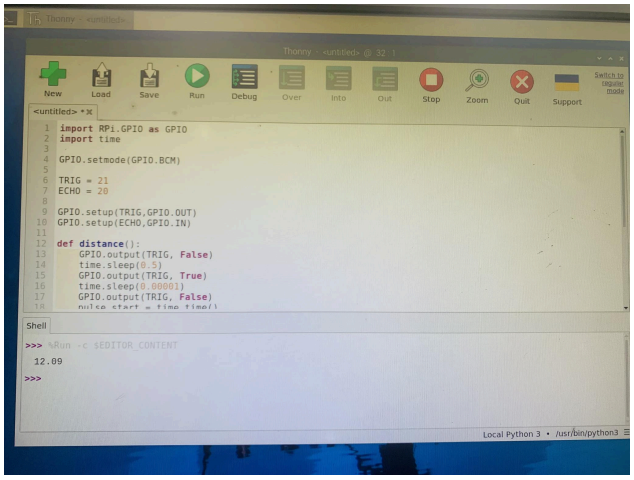
Circuit Diagram:



Circuit Setup:







Code:

```
import RPi.GPIO as GPIO
import time

GPIO.setmode(GPIO.BCM)
```

```
TRIG = 21
ECHO = 20

GPIO.setup(TRIG,GPIO.OUT)
GPIO.setup(ECHO,GPIO.IN)

def distance():
        GPIO.output(TRIG, False)
        time.sleep(0.5)
        GPIO.output(TRIG, True)
        time.sleep(0.00001)
        GPIO.output(TRIG, False)
        pulse_start = time.time()
        while GPIO.input(ECHO)==0:
                pulse_start = time.time()
        while GPIO.input(ECHO)==1:
                pulse_end = time.time()
        pulse_duration = pulse_end - pulse_start
        distance = pulse_duration * 17150
        distance = round(distance, 2)

        return distance

print(distance())

GPIO.cleanup()
```

Discussion / Q&A:

Question : Why are the resistors used?
Answer : The Raspberry Pi supplies 5V and the Ultrasonic sensor works in 3.3V . If we supply more than 3.3V, the sensor may get damaged or won't work properly . So we have designed the resistors in the circuit such a way that the input from one side will be 5V and the output will be 3.3V. By using a voltage divider circuit, the resistors proportionally divide the voltage from the Echo pin, reducing it to a safe level of 3.3V approximately that the GPIO pin can handle. The specific resistor values (1k and 1.5k) are chosen to achieve the desired voltage division ratio. This arrangement ensures that the voltage level received by the Raspberry Pi's GPIO pin from the ultrasonic sensor's Echo pin remains within the safe operating range, protecting the GPIO pin from potential damage.