Lab-2

Measuring Distance Using Ultrasonic Sensor

Group-4

Group Members

Fahim Morshed (20201133)

Sadat Noor Shibly (21101160)

Shakil Islam Shanto (20101318)

Kamran Hassan Shomrat (21101010)

Mollah Md Saif (20101416)

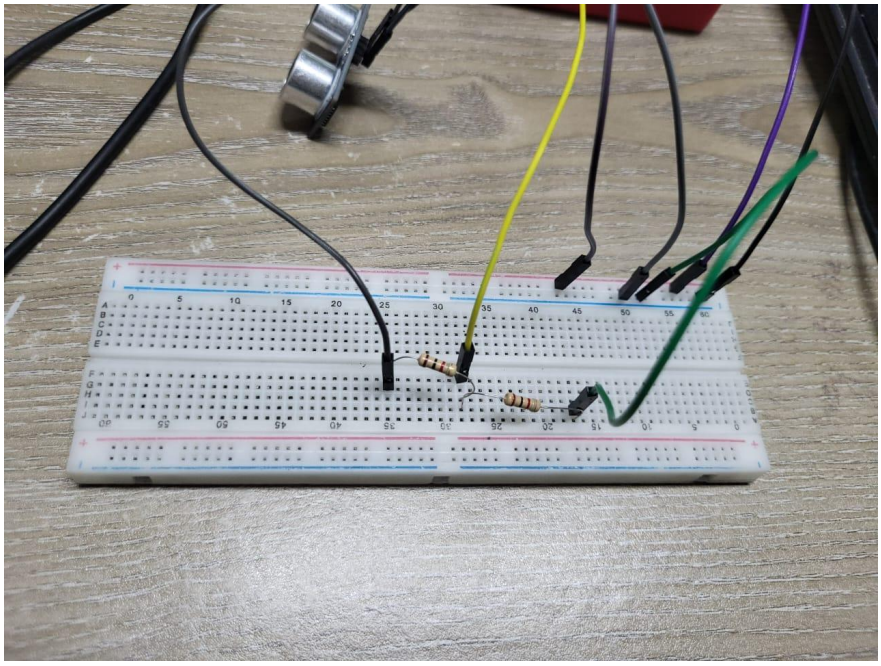
Task Description

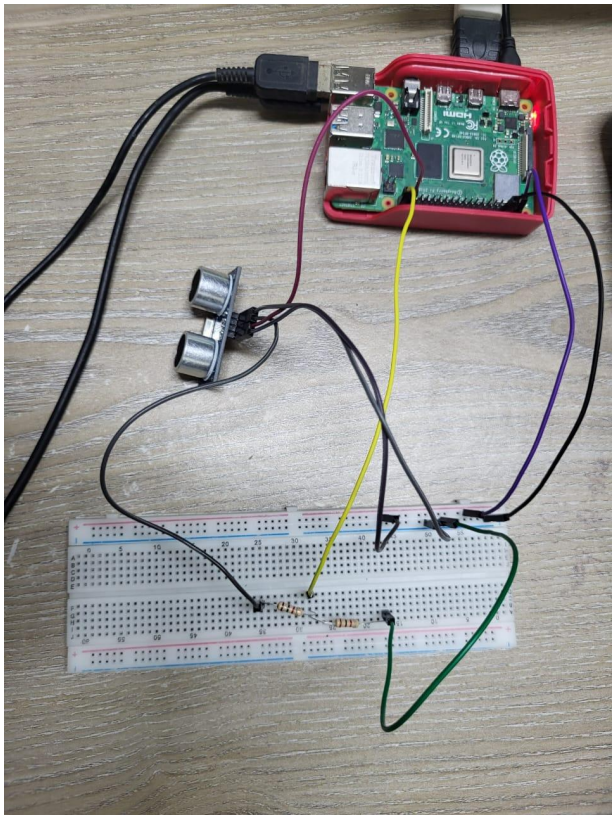
This lab focuses on measuring distance using an ultrasonic sensor with the help of a Raspberry Pi. This lab aims to demonstrate how to use an ultrasonic sensor with Raspberry Pi to measure distance accurately. This task consists of Raspberry Pi 4 setup, wiring the ultrasonic sensor with Pi, writing Python script for controlling the sensor, demonstration of the project, and documentation.

Components Required

1. Raspberry Pi
2. Ultrasonic Sensor (HC-SR04)
3. Breadboard
4. Jumper Wire
5. 1k and 1.5k resistor
6. MicroSD Card
7. USB Cable
8. Monitor, Keyboard, and Mouse

Circuit and Hardware Setup





Code

```
import RPi.GPIO as GPIO
import time

GPIO.setmode(GPIO.BCM)

TRIG = 20
ECHO = 21

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()
```

Output Result Description

In this setup, the ultrasonic sensor has the TRIG and the ECHO pin. An ultrasonic signal is triggered using the time function of Python, and subsequently, the echo reflected by an object gets captured. The difference between the times is used to calculate the distance using the given formula.

1. Why are the resistors used?

Answer: A Raspberry Pi cannot work with high-voltage inputs and outputs. The resistors are used to create a voltage drop and generate safe input and output voltages for the safety of the Raspberry Pi.