

Ultrasonic Sensor Project

Objective

The goal of this project was to connect an **HC-SR04 ultrasonic sensor** to the Raspberry Pi and measure distances using GPIO pins.

Requirements

Component	Quantity
HC-SR04 ultrasonic sensor	1
Raspberry Pi (any GPIO model)	1
Breadboard	1
Jumper wires	>10
Resistors (1 kΩ each)	2
Power source (5V from Pi)	1

Wiring Setup

- **VCC → 5V (Pi)**
 - **GND → GND (Pi)**
 - **TRIG → GPIO23 (Pi)**
 - **ECHO → Voltage Divider → GPIO24 (Pi)**
 - Voltage divider: Echo → [1kΩ] → Node → [1kΩ] → GND
 - Node goes to GPIO24
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Code

```
import RPi.GPIO as GPIO
import time

# GPIO mode
GPIO.setmode(GPIO.BCM)

# Define pins
TRIG = 23
ECHO = 24

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

def get_distance():
    # Send trigger pulse
    GPIO.output(TRIG, True)
    time.sleep(0.00001)
    GPIO.output(TRIG, False)

    # Wait for echo start
    while GPIO.input(ECHO) == 0:
        start_time = time.time()

    # Wait for echo end
    while GPIO.input(ECHO) == 1:
        end_time = time.time()

    # Calculate distance
    duration = end_time - start_time
    distance = duration * 34300 / 2 # cm
    return distance

try:
    while True:
        dist = get_distance()
        print(f"Distance: {dist:.2f} cm")
```

```
        time.sleep(1)

except KeyboardInterrupt:
    print("Measurement stopped")

finally:
    GPIO.cleanup()
```

Discussion

In this project, the **VCC pin** of the HC-SR04 was connected directly to the Raspberry Pi's **5V pin**, and the **GND pin** went to the Pi's ground. The **TRIG pin** was wired to **GPIO23**. For the **ECHO pin**, a simple voltage divider was built using two 1 kΩ resistors. The ECHO pin connected to the first resistor, the middle point between the two resistors was connected to **GPIO24**, and the second resistor went to ground. This reduced the 5V echo signal to a safe level for the Pi. All wiring was done neatly on a breadboard using jumper wires.

Conclusion

The ultrasonic sensor was successfully wired and tested with the Raspberry Pi. The wiring setup ensured the sensor worked safely with the Pi, and the test code confirmed that distance readings were being received correctly.