Tutorial: Distance Measurement with HC-SR04 Ultrasonic Sensor and Arduino

Introduction:
The HC-SR04 Ultrasonic Distance Sensor enables Arduino to measure distances between objects accurately. This tutorial guides you through using the sensor to measure distances and print them to the Serial Monitor in response to user input.

Components Required:
- Arduino board (e.g., Arduino Uno)
- HC-SR04 Ultrasonic Distance Sensor
- Jumper wires
- Computer with Arduino IDE installed

Wiring: See Fig1.
- Connect the trig pin of the HC-SR04 sensor to digital pin 9 on the Arduino.
- Connect the echo pin of the HC-SR04 sensor to digital pin 10 on the Arduino.
- Connect the VCC and GND pins of the HC-SR04 sensor to the 5V and GND pins on the Arduino, respectively.

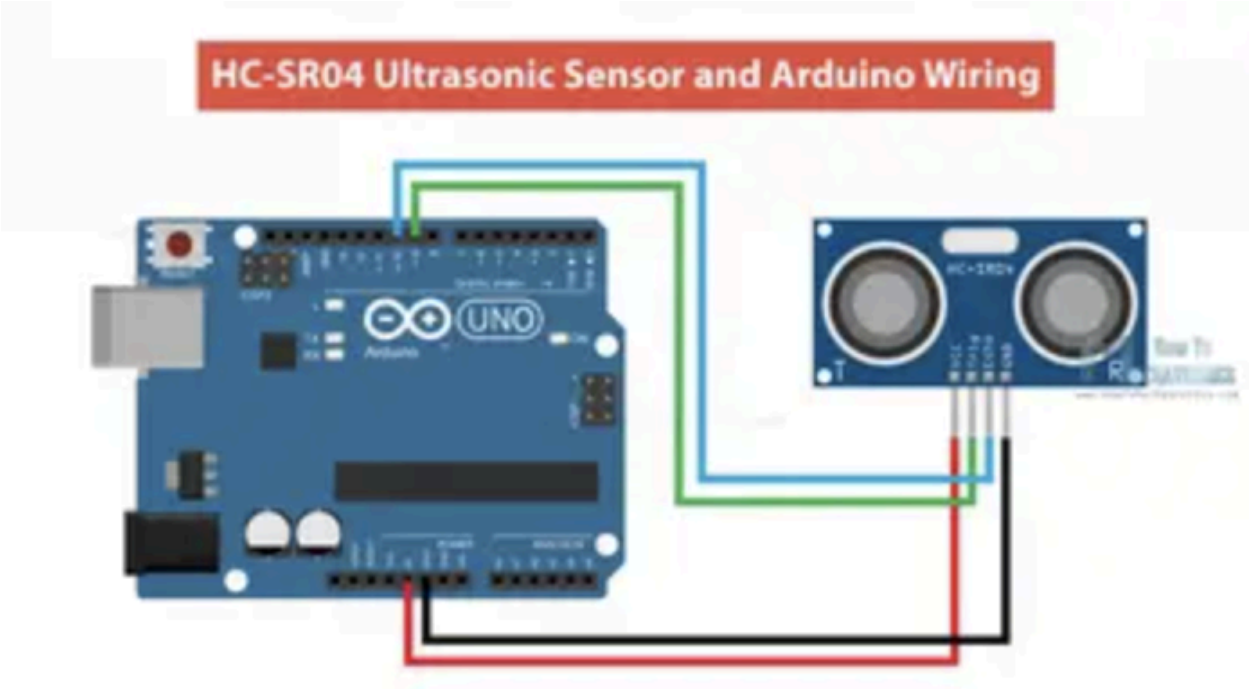

Fig1. Wiring

Code Explanation:
```cpp
const int trigPin = 9;
const int echoPin = 10;
bool distancePrinted = false;
```

```
void setup() {
  Serial.begin(9600);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
}

void loop() {
  if (Serial.available() > 0) {
    if (!distancePrinted) {
      digitalWrite(trigPin, LOW);
      delayMicroseconds(5);
      digitalWrite(trigPin, HIGH);
      delayMicroseconds(10);
      digitalWrite(trigPin, LOW);

      long duration = pulseIn(echoPin, HIGH, 20000);

      if (duration == 0 || duration < 116) {
        Serial.println("No valid pulse received or object too close");
      } else {
        float distance = duration * 0.0343 / 2;
        Serial.print("Distance: ");
        Serial.print(distance);
        Serial.println(" cm");
        distancePrinted = true;
      }
    }
    while (Serial.available() > 0) {
      Serial.read();
    }
  } else {
    distancePrinted = false;
  }
}
```

How to Use:
1. **Setup:** Connect the HC-SR04 sensor to the Arduino following the wiring instructions.
2. **Code Upload:** Copy and paste the provided code into a new Arduino sketch and upload it to your Arduino board.
3. **Serial Monitor:** Open the Serial Monitor in the Arduino IDE (Tools > Serial Monitor).
4. **Trigger Measurement:** Type any character and press Enter in the Serial Monitor to trigger a distance measurement.
5. **Distance Display:** The Arduino will measure the distance and print it to the Serial Monitor.

6. **Repeat:** Repeat steps 4-5 for additional distance measurements.

Summary:
This tutorial demonstrates how to use the HC-SR04 Ultrasonic Distance Sensor with Arduino to measure distances and print them to the Serial Monitor. By triggering measurements based on user input, you have control over when distance measurements occur, making it a flexible and user-friendly solution for various applications.

Sources:
Arduino wiring.
https://howtomechatronics.com/wp-content/uploads/2022/02/HC-SR04-Ultrasonic-Sensor-Arduino-Connection-Wiring-1024x580.png?ezimgfmt=rs:352x199/rscb2/ng:webp/ngcb2
Conversation with ChatGPT.
https://coloradomesa365.sharepoint.com/:b:/r/sites/HERBERT/Shared%20Documents/General/chatconvo.pdf?csf=1&web=1&e=2iZcjB