LamaPLC: HC-SR04 Ultrasonic Sensor Module

Ultra-Sonic Ranger sensors

This solution has two components: a speaker that sends out sound pulses and a microphone that detects their reflections. The distance is computed from the time delay between emission and detection, assuming the speed of sound.

HC-SR04

The HC-SR04 ultrasonic sensor module is a widely used, affordable sensor popular among hobbyists for electronics projects with Arduino and Raspberry Pi, enabling non-contact distance measurement and obstacle detection. It uses sonar to measure distance by timing how long sound waves take to reflect back.

Key Specifications

- **Operating Voltage: 5V DC**
- **Operating Current:** 15mA
- **Ranging Distance:** 2cm to 400cm (4m)
- **Accuracy:** Up to 0.3cm, though some real-world tests suggest around 1cm
- **Measuring Angle:** Less than 15 degrees in a cone
- **Ultrasonic Frequency:** 40kHz
- **Dimensions:** Approximately 45mm x 20mm x 15mm

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Arduino & HC-SR04

- **VCC:** Power supply (5V DC)
- **Trig (Trigger):** Input pin to trigger the ultrasonic burst
- **Echo:** Output pin that produces a pulse proportional to the time taken for the echo to return
- **GND:** Ground

To operate the sensor, a microcontroller (like an Arduino) must provide a 10-microsecond (µS) high-level pulse to the Trig pin. The module then automatically sends out an 8-cycle burst of ultrasound at

40 kHz and raises the Echo pin to a high state. The duration of this high-level signal on the Echo pin is the time the sound waves took to travel to the object and back.

The distance can be calculated using the formula:
Distance in cm = (Duration of Echo pulse in µS / 58)

```
const int trigPin = 9;
const int echoPin = 10;

float duration, distance;

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

void loop() {
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  duration = pulseIn(echoPin, HIGH);
  distance = (duration*.0343)/2;
  Serial.print("Distance: ");
  Serial.println(distance);
  delay(100);
}
```

HC-SR04, Ultrasonic, sensor, arduino, code

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