Ultrasound Module（HC_SR04）

Summary

In this project we will use an ultrasound module to measure distance and print it out on the Arduino serial port.

Materials

Arduino Uno x 1
HC_SR04 x 1
A number of Dupont wires

Product Description

This module measure distance accurately and features stable performance. Minimum distance is quite close at 2cm.
It can be used for robot obstacle avoidance, distance measurement, liquid level measurement, public security and parking lot detection.

Specification

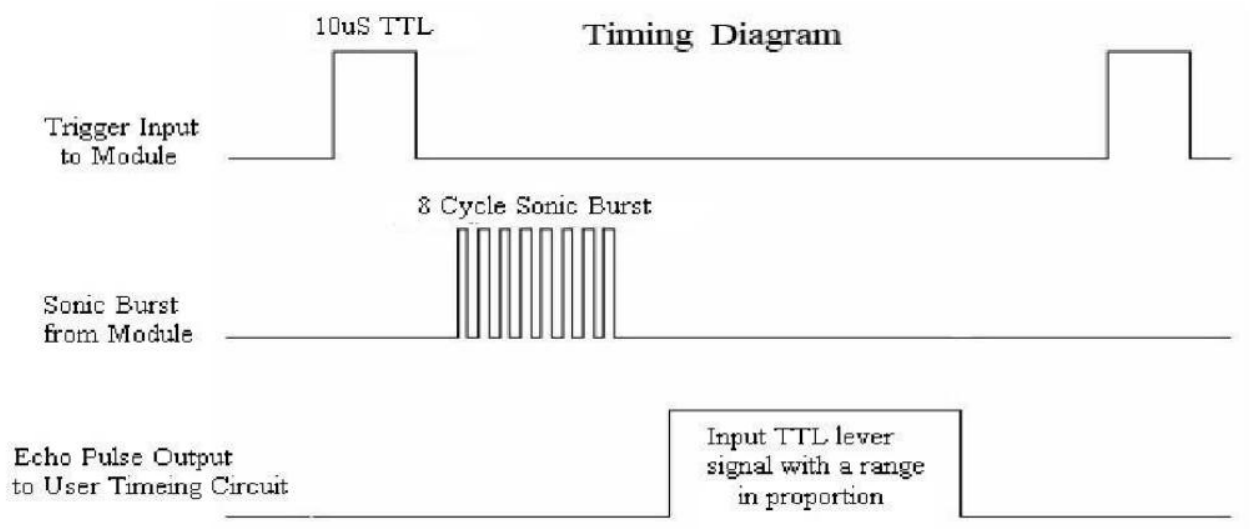
Working voltage：DC 5V
Quiescent current：less than 2mA
Electrical level output：high--5V
Electrical level output：low--0V
Detection angle：less than 15 degree
Detection range：2cm-450cm
High precision：Up to 0.3cm

Operational Principle

The device is triggered by a 10μs pulse on its Trigger Input
The module automatically transmits 8x40khz square waves, and detects if any signal is returned.
If there is a signal returned, it outputs a pulse on its output channel equal in length to the time of the ultrasound pulse from transmission to reception.
The detected distance of the object is then given by

*(the period of high electrical level * speed of sound(340M/S))/2*

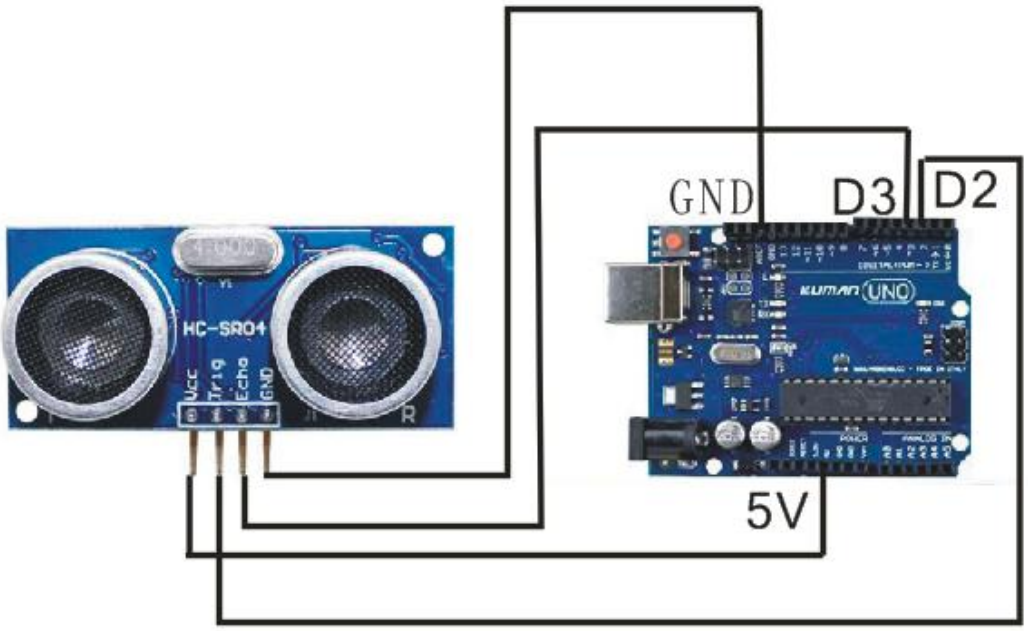
Use Method and Sequence Diagram



To use with an Arduino, the Arduino is used to generate a 10μs pulse on the trigger pin of the SR04 to start distance measurement.
The device will then trigger 8x40KHz ultrasonic pulses.
Use Arduino and adopt digital pin to offer at least 10μs high electrical level signal for Trig pin of SR04, to trigger SR04 module's distance measurement function and listen for any detected returns.
If a signal return is detected, the output pin on the SR04 will go high for the time of the detected transmission

to return. The Arduinos function pulseIn() can then be used to measure this time and used to calculate the actual distance from the measured object.

Wiring Diagram



Sample Code

```
// Define the SR04 connection to the Arduino pin
const int TrigPin = 2;
const int EchoPin = 3;
float distance;
void setup()
{   // Initialization of serial communication and SR04's pins
        Serial.begin(9600);
        pinMode(TrigPin, OUTPUT);
        pinMode(EchoPin, INPUT);
    Serial.println("Ultrasonic sensor:");
}
void loop()
{
    // Generate a high pulse of 10us to trigger TrigPin
        digitalWrite(TrigPin, LOW);
        delayMicroseconds(2);
        digitalWrite(TrigPin, HIGH);
        delayMicroseconds(10);
        digitalWrite(TrigPin, LOW);
    // Detecting the width of the pulse and calculating the distance
        distance = pulseIn(EchoPin, HIGH) / 58.00;
        Serial.print(distance);
        Serial.print("cm");
        Serial.println();
        delay(1000);
}
```

Notes

pulseIn()： Function for detecting pulse width for high and low levels measured on a pin.

pulseIn(pin, value)

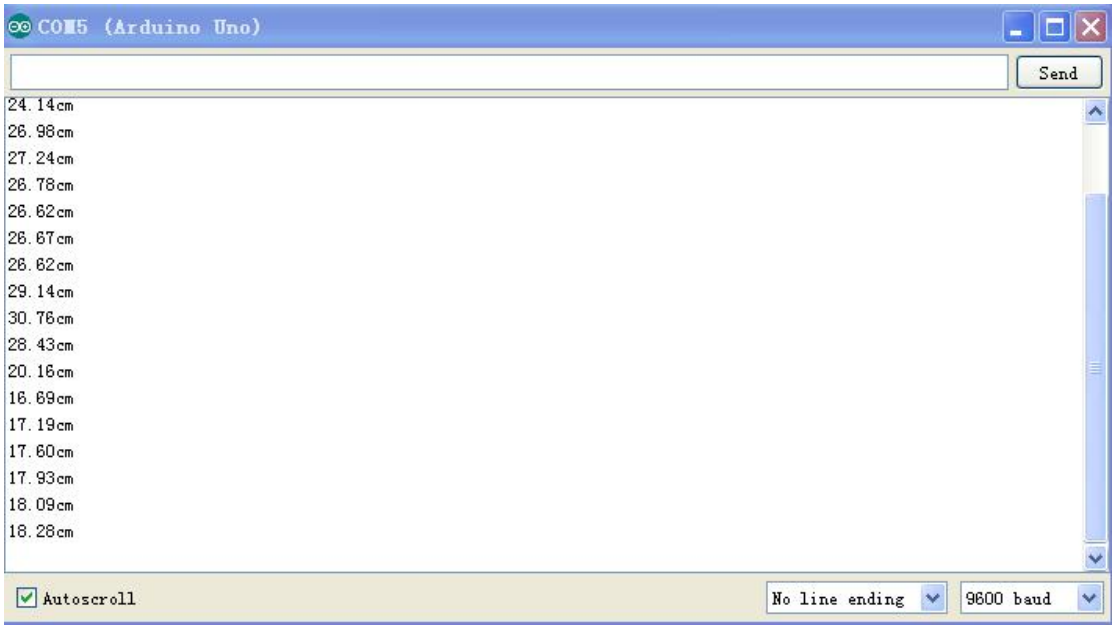
pulseIn(pin, value, timeout)

Pin---the pin which need to read pulse.

Value---the type of pulse which needs to read, HIGH or LOW.

Timeout---the unit is microsecond(μs)， the data type is unsigned long int.

Results


COM5 (Arduino Uno)
Send
24.14cm
26.98cm
27.24cm
26.78cm
26.62cm
26.67cm
26.62cm
29.14cm
30.76cm
28.43cm
20.16cm
16.69cm
17.19cm
17.60cm
17.93cm
18.09cm
18.28cm
Autoscroll
No line ending
9600 baud