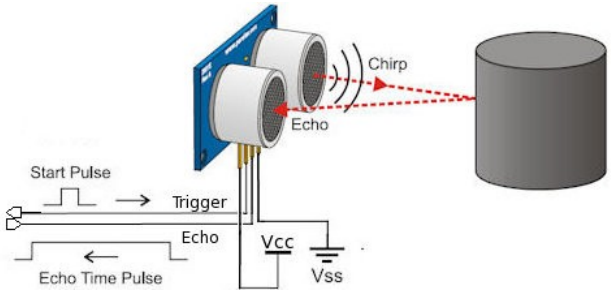
INPUT: Ultrasonic "Eyes" Range Sensor Using an ultrasonic ping sensor to detect object distance.

What:

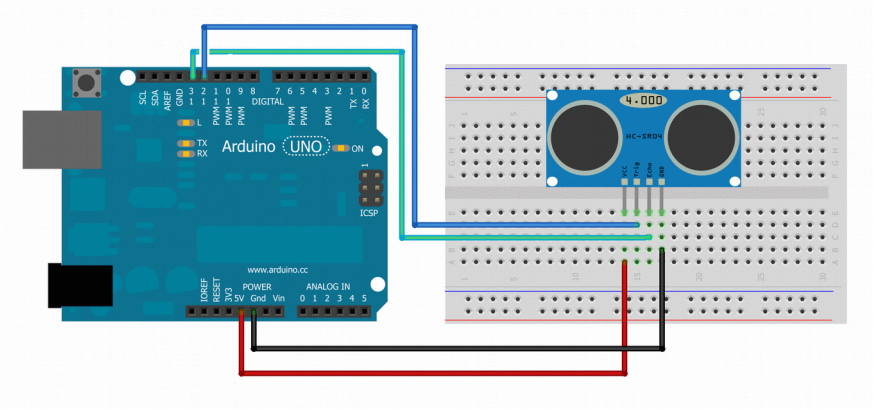
The ultrasonic ping sensor is simply a digital module that allows you to send out a "ping" in the form of a microsecond sound burst, listen for the return echo and given the approximate speed of sound in air (using the delay between the ping and the echo back) calculate the distance to the object. Some ping sensors have a single ping/echo pin that you both send on and listen on (output + input), while others (such as the one we're using here) have one pin dedicated to the ping (called the "trigger") and one pin dedicated to receiving the echo (called "echo"). There is no analog signal processing that needs to be done as this is all handled by the module, so we're just dealing with a nice clean, processed digital I/O signals and microsecond timing. However, the microsecond timing is very critical, and some cheaper sensors can not resolve distances much over a foot out.



How a ping sensor detects distance.

How:

Hook up the ping sensor to any two digital I/O pins free on your arduino. Here we're using pins 12 (trigger) and 13 (echo). Be sure the Vcc (+5V) and GND are correctly wired before applying power.



NOTE: If you have the US-100 version of this module, remove the jumper from the rear to make it use pulses instead of serial data.

No load up the build in example code from Examples / Sensors / Ping. This example code is made for the three pin Parallax version (with just one pin for trigger & echo), however you can easily modify it to work as seen below:

```
#include <Arduino.h>

const int triggerPin = 12;
const int echoPin = 13;

void setup() {
  Serial.begin(9600);           // For outputting distance data
  pinMode(echoPin, INPUT);      // Make echoPin an INPUT
  pinMode(triggerPin, OUTPUT);  // Make the triggerPin an OUTPUT
}

void loop()
{
  // establish variables for duration of the ping,
  // and the distance result in inches:
  long duration, inches;
```

```
  // The PING))) is triggered by a HIGH pulse of 2 or more microseconds.
  // Give a short LOW pulse beforehand to ensure a clean HIGH pulse:
  pinMode(triggerPin, OUTPUT);
  digitalWrite(triggerPin, LOW);
  delayMicroseconds(2);
  digitalWrite(triggerPin, HIGH);
  delayMicroseconds(5);
  digitalWrite(triggerPin, LOW);

  // A HIGH
  // pulse whose duration is the time (in microseconds) from the sending
  // of the ping to the reception of its echo off of an object.
  duration = pulseIn(echoPin, HIGH);

  // convert the return echo time into a distance
  inches = duration / 74 / 2;

  Serial.print(inches);      // print it out to the serial port.
  Serial.println("in, ");

  delay(100);
}
```

Git code: **https://github.com/LetsCodeBlacksburg/arduino-robotics/tree/master/LCBB_ping_trigger_echo_sensor_simple**

After compiling and running this, then click on the serial monitor icon , you should get a stream of distances like this:

```
10in,
11in,
7in,
6in,
4in,
3in,
2in,
1in,
1in,
1in,
1in,
2in,
```

Think about at what distances you want to do things like (if doing a robot) slow your robot, stop your robot, or change directions.

Fail:
No distance readings can result from:

- bad wiring of power or trigger / echo pins
- not defining triggerPin as output and echoPin as input (or using them correctly)
- code typos