## Ultrasonic Range Finder

This sensor measures distances by timing how long it takes an emitted sound to return as an echo. On the Serial Monitor you will see the sensor’s readings in centimeters.

Experiment with the sensor to learn about its capabilities, accuracy and limitations. There are 3 objects to use as targets:

* + A wooden block
  + A whiteboard marker
  + An adorable puppy

1. **Test the sensor’s accuracy with different objects.**  Notice that your hand will trigger the sensor, so you need to stay clear to get a good reading. Surprisingly, even relative small objects, like the marker standing upright, can be detected quite well.

Notice how the puppy appears to have powers of invisibility. Why is that? Try putting the marker in front of the puppy. Can you see (hear) him now?

1. **How far away can objects detected?** This sensor is rated for up to 4 meters. Try several measurements, both close and far, with each object. Do you see a difference between the targets? Notice that sometimes the sensor returns crazy readings. It’s important to filter out that noise when using this type of sensor, by limiting the acceptable range of values.

The orientation of the object matters as well. Try angling the surface of the block away from the sensor. How much of an angle can you introduce before the readings begin to erode?

1. **Sound waves disperse as they travel**, so the sensor detects items within its cone of sound. Try finding how wide this cone is at 1 meter from the sensor. As you move further out, the cone begins to collapse (think teardrop shape), as the reflected sound gets weaker at the limits of the sensors range.

1. **This sensor is capable of taking 40 samples per second**. It’s currently running at 20 samples per second. Test by passing your hand in front of the sensor quickly to get an idea of its response time (try not to hit the table…ouch).

Try placing an ear near the sensor and listen to it ‘tick’. Your hearing what 20 pulses per second sounds like. If it isn’t ticking, it isn’t working.