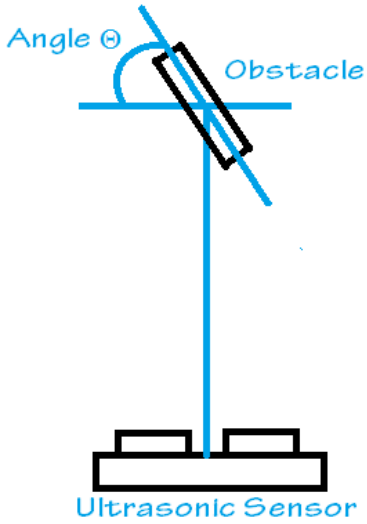
Ultrasonic Sensor (HC-SR04) :

For the working of ultrasonic sensors: refer to the attached manual

Observations:

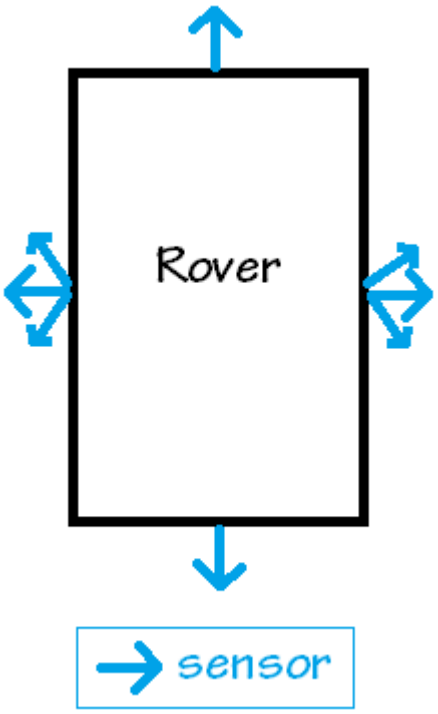
1. Range — 27 inches (2.25 feet)
2. Field of View — Vertical: 30 degrees
   Horizontal: 53 degrees
3. Angle Test — Sensor starts losing signals when the angle Θ shown in the figure exceeds 20 degrees



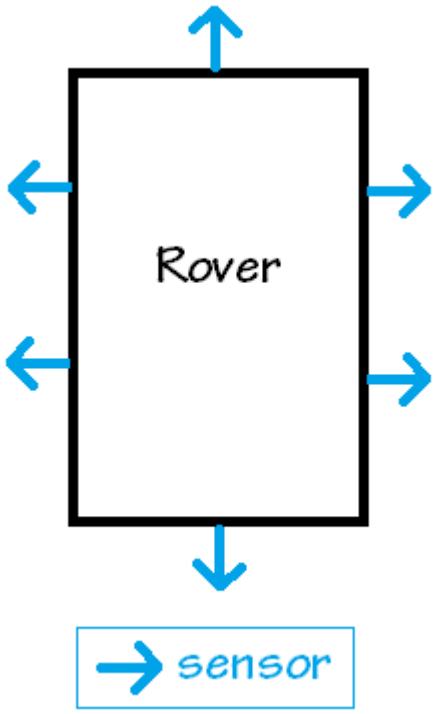
4. Material Test (Sand) — Fluctuations occur more frequently than for a flat surface. Otherwise, the accuracy is comparable to the flat surface scenario.

5. Interference between two sensors — No interference is observed when the sensors are placed parallel and adjacent to each other
   Fluctuations in the readings are observed as the angle between them is decreased to 80-90 degrees. However these are insignificant.

6. Placing of sensors



Here three sensors are placed on each side in an orientation that maximizes the field of view.



Error in observed values: +- 1 inch

Work to be done:

1) Make an obstacle avoiding bot using ultrasonic sensors and Rpi.

2) Research on encoding of these sensors.