

Quiz Answers: Field of View

Introduction to Mobile Robotics > Field of View Exploration

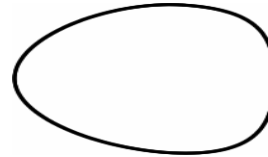
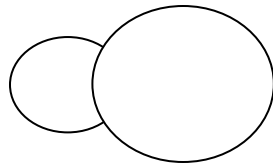
1. Describe or sketch the general shape of the area that the Ultrasonic Sensor can detect.

The graph should have a few key features:

- Widening and thinning detection shape
- Most distant point along the centerline

It may also show:

- Short and long range detection “bubbles”



2. Answer the following questions.

- a. What is scale (size ratio)?

Scale (size ratio) is the ratio of the “miniaturized” measurements to the “real” measurements. A size ratio of x:y means that for every distance x on the scale model, the real object had a distance of y. It can also be described as “the amount you shrunk the real object by to make it fit on the page” in the context of this experiment.

- b. If a graph on a sheet of paper has lines 1cm apart, and the lines are labeled in increments of 1m, what is the size ratio of the graph?

The size ratio is 1:100 (1m = 100cm), because a 1cm distance between lines on the scale model represents 1m (100cm) of distance in the real world.

3. Sound travels at 340m/s at sea level. Ricky’s Ultrasonic Sensor detects an object 42cm away. How long did the sound wave take to travel from the Ultrasonic Sensor to the object and back? Show your work.

Distance to the object = 42cm

Distance to the object and back = 42cm x 2 = 84cm

84cm = 0.84m

Speed of sound = 340m/s

Time to go 0.84m = distance / speed = 0.84m / (340m/s) = 0.0025s = 2.5×10^{-3} s = 2.5milliseconds

It takes sound 2.5milliseconds to get to the object and back. That is $1/400^{\text{th}}$ of a second!