

# Introduction to Robotics

## Homework E

You may pick your assignment, either the maze problem, or the ultrasonic sensor problem.

### Maze Problem

On your foam core place strips of black tape to form a maze similar to the one shown below. Doesn't need to be exact.

The goal for your robot is to start on the right bottom, follow the black tape (not bounce off it) and make it, unaided, to the bottom left exit.

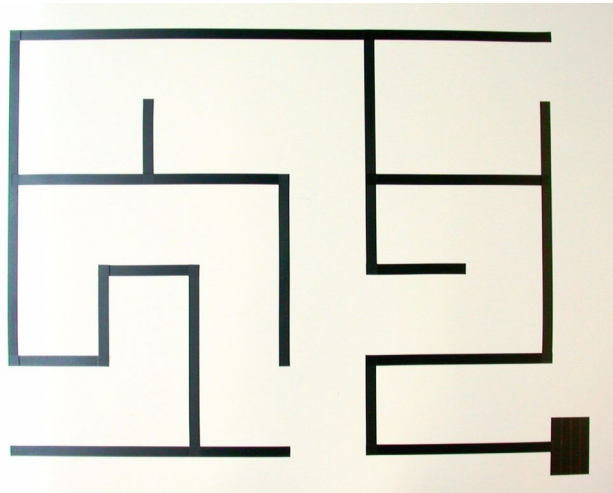


Figure 1: Sample Maze

### Ultrasonic Sensor

Write a program to find the closest object, approach it, and stop three centimeters away from it.

To accomplish this, modifications will have to be made to your *3Pi* board.

A kit can be provided to you to add an ultrasonic sensor board to your 3Pi, including female cables to attach to header pins on the sensor board and the 3Pi.

Details of the hookup are shown in Figure 2.

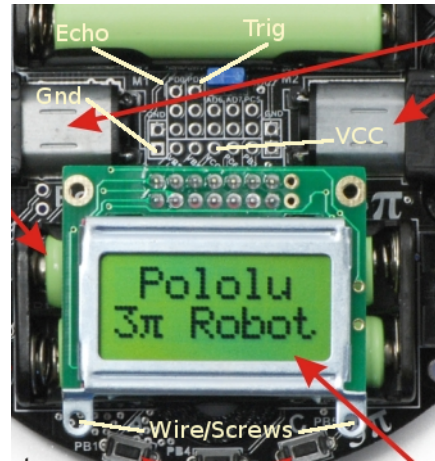


Figure 2: Wiring Diagram

A low level driver `HC04.c`, and `HC04.h` can be provided. The driver will update a global variable `hc04_distance` 60ms after its `trigger()` function is called. The delay allows the echo to return (and its time to be measured) after hitting the object directly in front of the sensor.

You must also call `hc04_init()` to initialize the driver. It sets up all the timer registers in the hardware.

You can choose not to use the driver and write your own interface. The HC04 datasheet is up on our website.

The sensor is crude since it has a somewhat wide beam angle and reflections of sound can do crazy things. So, don't expect perfection. The driver might even have bugs :-).