

California State University, Fresno

Department of Electrical and Computer Engineering

ECE 1L – Introduction to Electrical and Computer Engineering Laboratory

Laboratory 5: Tactile Navigation with Whiskers

(The Boe-Bot, Board of Education, HomeWork Board, BASIC Stamp 2, and BASIC Stamp Editor are registered trademarks of Parallax Inc.)

1. Background Information

Your Boe-Bot has been setup for use of the whiskers, in addition to containing an external power supply. Use the power supply for as much of the lab as possible, and save the use of the batteries for when you are ready to place the Boe-Bot on the ground to let it run. Be sure to use the same numbered Boe-Bot as the previous lab, and if you feel that your servos are not centered properly, ask your lab instructor for help!

2. Whisker Circuits

Whiskers Schematic

Turn to Figure 5-4 in the Boe-Bot manual (Page 168), and explain the operation of the circuit in your lab notebook. When the right and left whisker switches are open, what is the voltage into Pins P7 and P5? What logic level does this represent? When the right and left whisker switches are closed, what is the voltage dropped across the 10k Ω resistor, and across the 220 Ω resistor? (Be careful!) What is the voltage into Pins P7 and P5? What logic level does this represent? Make sure that you fully understand the operation of the whiskers based upon the circuit before proceeding any further.

Learning the use of the Whiskers

Starting from Page 168, work through the remainder of Chapter 5 in order to learn how to use the whiskers (be sure to include your start/stop button in each of the programs!). You should be able to finish this portion of the lab by the end of your first lab session.

3. Design Project

Skimming along a Wall

Program your Boe-Bot find a wall, and then skim along it. Here are the specifications:

1. The Boe-Bot should be placed parallel to a wall, two feet away (facing either

- direction), before being turned on with your button.
2. The Boe-Bot should “feel” for a wall both to the left and to the right of its initial position using the whiskers, but should never have to look for a wall further than 2 and a half feet away to the left or right of where it was initially placed on the ground.
 3. Once finding a wall, the Boe-Bot should continually hug as close to the wall as possible, and for as long a distance as possible. To help you in this process, you may wish to code the Boe-Bot to continually turn slightly toward the wall to keep it close (once the robot finds it), and every time a whisker makes contact, the Boe-Bot turns slightly away from it before turning into it again. This way, the Boe-Bot is constantly turning away from the wall, and back into it again.

Extra Credit

Program the Boe-Bot to start from any position on the floor and find a wall to hug. The Boe-Bot should then continue to follow the wall, even if it means turning 90 degrees once the wall joins with a second one. There are two cases to consider. First, the second wall may be directly in front of the Boe-Bot, meaning that the Boe-Bot must “crash” into it with the whiskers before making a turn. (This is the case when the Boe-Bot hugs the walls of the room.) Second, the wall may turn away from the Boe-Bot, in which case the Boe-Bot will lose the wall altogether unless it turns 90 degrees back toward it. (This is the case when the Boe-Bot hugs the outside walls of a cardboard box.)