Robots

Note: by their very nature, robots require a number of parts, software, etc., and are not cheap. Please, at all times, keep all the parts of each robot together in its box, I do not want to see things spread across a table except when you are working on them. Be sure to clean up every day.

This lab is very little about the writeup, and is about learning to control the robots. Do not worry if the writeup is short, just make sure you have learned to run all three robots, and have shown evidence that you have done so. Be sure to report difficulties.

Background

- What is a microcontroller?
- What is a robot?
- Why do we care? Where are they used?

We have three robots we want to learn to control, and have them do tasks for us. Each robot requires a computer to run software that will allow us to program the robot, an interface, and the robot itself. Some instructions and some documents can be found on the P:\ drive in the physics folder, and then in the robotics folder.

1. The first robot we have is the ACV (algebraically controlled vehicle), which is already programmed for us. We are limited in the commands that we can send to the robot, since we cannot program it. This robot also has no feedback, but will just perform a task (move) for us. Make sure the robot has batteries, and the Digi cable coming out of the SensorDAQ can be connected to a sensor such as a motion detector.

   a. Install the software on one of the computers in lab. Instructions can be found in the ACV Documents folder (P:\physics\robots). The file referred to on the NI wesite is already downloaded to the ACV folder. The robot connects to that computer with its USB cable. Which computer is the software installed on?

   b. Run each of the three control programs, describe what each does (more clearly than the instruction book.)

   c. Program the robot to initially move in one direction, while accelerating in the opposite direction, just like a ball thrown into the air. Supply the equation that you used to control the robot in this way.

   d. Make sure that the instructor has seen your ability to control this robot.

2. Your second robot is the Boe-Bot which is an example of a low-cost microcontroller which you could use to do many things. It is programmed using a BASIC programming language. Become familiar with this robot by doing the following.

   a. Access and install the software as in Activities #1 and #2 in the manual Robotics with the Boe-Bot (filename Roboticsv2_2.pdf). Be sure to install this on a different computer from the ACV, and be sure to indicate which computer it is installed on.
b. The Boe-Bot is mostly setup for you. Skim through Activity #3 to make sure it is all setup. Consider testing or replacing the batteries. Test for communication as on page 21. Report the result.

c. Skim the manual, making sure you understand the activities, until you reach Activity #4, centering the servos. The servos are already attached to the wheels. I am assuming they are already centered, too, but check this by running the program. Report the result.

d. Skim whatever you need to figure out how to do the Activity starting on page 101, re-testing each wheel. Report the result.

e. Skim Activity#4 starting on page 111, and then figure out how to make the Boe-Bot accelerate. Write a program that makes the Boe-Bot accelerate, ideally like the ACV did, but one direction is okay. Be sure to include the program in your writeup, and be sure that the instructor has seen that you can control this robot.

f. Feel free to move to the next chapter and make the Boe-Bot do more fun things.

3. The third robot is the most complex, and is the LEGO robot. It uses a modular programming language that you will learn to use.

   a. Install the software on a different computer in lab (different from the other two robots), and be sure to indicate which computer it is on.

   b. The LEGO robots are new, and we are going to learn how to run these together. Your goal is to learn how to use and program the LEGO robots, then you should choose an activity that would be fun and educational to demonstrate at the Science Festival. I would suggest Robodog, but if you find one you would prefer at the LEGO website: http://www.legoeducation.us/activities/section.aspx?CategoryId=159, you can go ahead and do that one.

   c. Discuss what you did, and what you got the robot to do. Include instructions on how to operate the robodog, or whatever it is that you choose.