CMPT240/PHYS240:
Introduction to Robotics (3 Credits)
Fall 2013; TR10:30-12; 113 Fisher

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Text: Robotic Explorations by Fred G. Martin. The website that accompanies our hardware, http://www.handyboard.com, has links to many robotics sites.

Course Description: This course gives an introduction to the background and theory of robotics, as well as to the practical electronic, mechanical, and programming aspects of building and controlling robots. Topics include sensors, feedback, control, and mechanical construction. For ease of prototyping we use an off the shelf robot controller, the Handy Board, an 8-bit microprocessor that can run Interactive C, and the LEGO Technic system. Along with a variety of sensors, these materials will allow the class to work through a series of projects that introduces robotics. In a broader sense, this course serves as an introduction to solving engineering problems.

Course Prerequisites: There are no formal prerequisites for this course, though you must be willing to think analytically to solve problems. If you do not know the programming language Interactive C (obviously related to C), you will learn as you go. No previous robotics experience is required.

Coursework and Grading:

There will be a six projects, approximately one per week, each which will involve designing and building (or modifying) a robot to carry out a specific task. For each project you will need to hand in a short (1-2 page) report describing your solution to carrying out the task. Although you may be working in pairs, each student needs to turn in an independently written report. You will be graded both by demonstrating your solution and by your reports, which should show you understood the theory behind your solution. These projects and reports will comprise 40% of your course grade.

20% of your grade will be based on a midterm exam. This exam will test your ability to program in Interactive C, and understand algorithms, sensors, feedback, and basic electronics and mechanical design. 20% of your grade will derive from a class robotics contest, and the final 20% will result from either a second contest, or an independent project.

Attendance: I will spend class going over key concepts, and helping you troubleshoot, but you must do the reading and designing on your own. I would like the robots and construction materials to stay in the lab, but I will make sure the lab is open and available for your use during specified times to be announced.

Tentative Schedule

You should do the assigned reading before the week that we cover the topic, so that you'll be prepared to work on the project that week. You may sometimes find it helpful to read some of the appendices, particularly Appendix B, Construction Techniques; Appendix C, Serial Communications and Data Collection; and Appendix E.3, Interactive C (IC). Please note that the IC interface that we use differs somewhat from that assumed in the book.

Week	Topics	Reading
August 26	Interactive C and the Handy Board	Chapter 1, 2.1
	The Handy Bug	2.2, 3.1-3.3
September 2	switch sensors and light sensors	2.3-2.5, 3.4
	randomness and meta-sensing	2.6-2.8
September 9	reflective optosensors, break-beam sensors	3.5-3.7
	shaft encoding	3.8
September 16	DC motors, gears	4.1, 4.2, 4.5
	motor control, servo motors	4.3, 4.4
September 23	feedback	5.1
	proportional-derivative control	5.2
September 30	sequential control	5.3
October 7	reactive control	5.4, 5.5

BREAK

October 21	required robotics contest	
October 28	required robotics contest	
November 4	required robotics contest	
November 11	optional robotics contest or independent project	
November 18	optional robotics contest or independent project	

BREAK

December 2	optional robotics contest or independent project	
December 9	optional robotics contest or independent project	

For the independent project you will likely need to do additional reading. Chapter 6 covers Advanced Sensing, Appendix A covers Microprocessors and Assembly Language, and Appendix F has information on various Robot Contests.