CS148: Building Intelligent Robots - Introduction

Overview

This course addresses the problem of controlling physical systems that operate in dynamic, unpredictable environments. Students will, in pairs, build their own mobile robot, and program it to perform a variety of simple tasks. In addition, the course will cover the major paradigms of robot programming and will study architectures for building perception and control systems for intelligent robots. Prerequisites: CS16 required, CS141 recommended.

Students will read papers, answer questions, and discuss the papers and questions in class. In addition, they will complete assignments culminating in a final robot project. Graduate students will carry out a more substantial final project, to be arranged with the professor.

Enrollment is limited to 20 students. Students have been chosen at random, with some bias in favor of academic year, robot experience, and Lisp experience.

The Staff

Professor: Leslie Kaelbling
TAs: Daniel Gillmor (dkg), Elliot Winard (enw)
Graduate Creative Consultant: Bill Smart (wds)

Office hours will be posted on the web page (http://www.cs.brown.edu/courses/cs148/).

Logistics

The course will meet for lecture on Fridays from 3 to 5:30. You will also be expected to attend a 2 hour laboratory section once a week. Laboratory sections will take place in or around room 472 on the fourth floor of the CIT, the Lego Lab. You should arrange the time of your section with one of the TA's.

There are two texts for this class, and several handouts. The texts are: *Vehicles* by Valentino Braitenberg, and a draft of the first two sections of *Embodied Intelligence* by Rodney A. Brooks and Cynthia Breazeal Ferrell. Both should be available from the Brown Bookstore. The handouts will appear in class as you need them, and we ask that you pay a $5 copying fee at the start of the semester to cover these costs.

In teams of two, students will construct a robot from LegoTechnic^{TM} components, controller boards based on the MC68HC11 processor, and a variety of sensors. You and your partner will write robot programs on the SPARCstations and download them to your robot for testing or demonstration during lab. Note that you are free to choose your partner but graduate students must be paired together as they are expected to have a more developed final project.

Knowledge of Lisp is not a prerequisite of the course; however Lisp is an essential building block from which our projects will grow and it is important that you quickly become familiar with it.

We will have a Lisp help session on Monday, January 26th for those who want it. This can serve as a refresher or introduction. Those who feel comfortable and experienced in Lisp need not attend.

Assignments and Grading Standards

Grades will depend on robot projects, participation, and readings. There will be weekly readings assigned along with 4 or 5 questions covering that material. These questions should take no longer than 30 minutes to write up. These responses must be turned in at the beginning of class the week the corresponding papers are to be discussed. No late answers will be accepted. These will be graded with a check, check-plus or failure.

In this course you will be working in teams for most of the robot projects. For these projects, you are expected to work in tandem. However, for each project, individuals will turn in their own brief lab report covering what was accomplished, what was not, what you would have changed, etc.

Relative Weights of the Assignments

Reading, written responses, and participation in class:	25%
Robot projects and project reports (not including the final project):	45%
Final Project	20%
Final Paper	10%

Ramona Lab

There will be a lab to work with Brown's research robot, Ramona. Students who complete this lab will become comfortable with Ramona and her capabilities, and be better prepared to do projects with her in the future. In addition to this, they will get extra credit points based on the extent and quality of their work.

Late Policy

Written homeworks on readings are assigned to stimulate discussion during class, and therefore will not be accepted after class begins. On all other assigments, the late penalty will be 10% off its grade for each day late. Note that if your labs are late, you will need to renegotiate a meeting with your TA, who may not be able to make it at your earliest convenience. These days will also cost you points.

Collaboration Policy

Collaboration in this field and in this class is a positive thing. However, do not cheat. Your work, both in the laboratory and in the written assigments, must be your own. While you and your partner will build and program your robot together, your lab writeups should be your own analysis of your robot's performance.

Robot Kits

We require a $50 deposit (a check made out to Brown University -- NO CASH) on the robot kits from each student. You will not receive your robot kit until you and your partner have submitted your deposits. At the first lab section you will be given most of your robot kit; therefore you **must**

bring your deposits with you to the first lab section.

As long as your robot kit is returned in good condition, your check will be returned uncashed at the end of the semester. You are responsible for all the kit's parts until the end of the semester. Do not lose items, or you may forfeit your deposit. All kits must be disassembled and returned before your deposit will be returned and your grades submitted.

Lab Schedule and TA Hours

Elliot and Daniel will each hold 4 office hours per week in the Lego Lab, room 472 of the CIT. Lab meetings will also be in the Lego Lab. Please show up for your arranged lab time promptly, since there will be other students meeting after you.

Communication

To contact your TAs, mail to cs148tas@cs.brown.edu. Please feel free to come by our office hours and discuss any topics you would like. Do not hesitate to contact Daniel or Elliot during their office hours or send them mail at dkg@cs.brown.edu or enw@cs.brown.edu to make an appointment.

In this course, we will be using news as our source for communication. Please subscribe to and read daily the cs148 newsgroup(brown.cs.cs148). If you are not familiar with news, please see a Sun Lab consultant or TA for help.

Also, we will be maintaining the course web page (http://www.cs.brown.edu/courses/cs148/), where on-line resources, interesting related materials, and copies of course documentation will be available.

Handouts and Handins

- Copies of reading materials and other handouts will be distributed in class and remaining copies will be available in the black file cabinet outside the TA room. Most handouts and assignments are also available on-line: see the /course/cs148/labs, /course/cs148/readings and /course/cs148/handouts directories.
- Written homeworks on the readings should be turned in at the beginning of class.
- To hand in assignments that are strictly programming assignments, you should print out a copy of your file, and indicate where the file resides in your home directory. You should hand in the hard copy of the file in class on the day the assignment is due. Since there are only a few assignments which rely only on programming, we will not have an electronic handin.
- For robot projects, lab reports and accompanying code should be turned in at the lab section you attend. You will then demonstrate your assignment to your lab TA.