

91.549, Robotics II, Fall 2003 Syllabus

Contact Information

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Class Meetings

Thursdays, 5:30-8:30, Olsen 412 (lecture) and 304 (lab)

Office Hours

Tuesdays 1:00 to 2:00 in Olsen 304
Wednesdays 1:30 to 2:30 in Olsen 304
Thursdays 4:15 to 5:15 in Olsen 304

You may also make an appointment with me if you can not make it to the scheduled office hours.

Course Description

In Robotics I (91.548), you learned about robotics at the processor level, building your own creations using sensors and integrated circuits. In this course, we will explore a different side of robotics, focusing on artificial intelligence for robots. You will be programming Pioneer robots using Pyro (*Python for robots*). These robots have a fixed sensor set and fixed sensor placement – the course will be more of a software course than a hardware course.

Topics to be covered during the course include robot architectures, vision (including color vision processing, edge detection, and optical flow), machine learning (including reinforcement learning and neural networks), mapping and localization, and multi-agent robotics.

Classes will start with a lecture in Olsen 412. After lecture, there will be a short break as we move down to lab in Olsen 304.

Textbook and Readings

Artificial Intelligence and Mobile Robots

Edited by David Kortenkamp, R. Peter Bonasso, and Robin Murphy
MIT Press, 1998

This book is a collection of papers, mostly about robotic systems that were developed for the AAAI Mobile Robot Competition during the first years of the competition.

We will also read other research papers during the term. Links to these papers will be placed on the course web site.

Course Website

<http://www.cs.uml.edu/~holly/91.549>

Software

We will be using Pyro for programming in this course, which is available on all of the computers in the robotics lab (Olsen 304). You will have 24 hour access to the lab using your id. If you're like to install Pyro on your own linux system at home or work, you can download Pyro for free. The installation and details about how to install Pyro can be found at <http://www.pyrorobotics.org/index.cgi/PyroInstallation>

Hardware

We will use Pioneer robots, built by ActivMedia, in the course. These are research grade robots that include 16 sonar sensors (8 in the front and 8 in the back), a color camera, an array of bumpers in the back, and a gripper. You will need to be in the lab to use the robots – they can't go home with you. This will mean that you should expect to spend significant time outside of class working in the lab for robot-based labs and projects (most will require the use of the robot rather than the use of the simulator).

Course Requirements

Assignments (Labs):

There will be weekly assignments, mostly consisting of a laboratory portion using the Pyro software to develop code for simulated and real robots. Some of the labs will require you to demonstrate your code running on the robot for me. For these labs, there will be sign up sheets

Projects:

During the term, there will be two projects: one on vision and another on a topic that you will choose in consultation with me.

- The first project will start on 9 October and be due on 30 October. Each project team must give a short presentation on their project (5-10 minutes), in class on 30 October.
- The second project will start after the first project is turned in and will be due on the last day of class. Each project team will give a short presentation (5-10 minutes) on their project on 11 December, the last day of class.

For the project presentations, you will need to make a video of your robot project – we will not run live demonstrations during the class (you'll learn that robots don't necessarily cooperate for demos). The lab has a video camera and a Mac for this purpose.

For each of the two projects, you will need to turn in a paper describing the problem you were trying to solve, your approach to solving the problem, and discuss related research on the topic. When writing these papers, you should think about modeling them on the research papers that you'll be reading during the term. Including figures, both diagrams and photos, is highly encouraged. An appendix to your paper should contain the complete code for your project, even if you have included smaller portions of the code in the paper.

Exam:

There will be an in-class exam in the lecture room on 20 November, covering all material in the course up to and including 13 November. The exam will last no more than 90 minutes, at which point we will move to the lab for the remainder of the class time.

Grading

Assignments (Labs)	35%
Project 1	20%
Project 2	25%
Exam	20%

Collaboration Policy

Depending upon the size of the class, there may be enough computers for each person to have their own workstation. If this is the case, there will be some individual assignments and some assignments that may be done in a group, if desired.

Assignments indicated as individual assignments are to be completed by one person.

You may discuss assignments, but you must write your own robot code and write your own answers to questions. To learn, you'll need to program robots, not just copy someone else's code.

Homework Policy

All work must be turned in at the start of class on the date it is due in order to receive credit. This is to prevent people from working on old assignments when new material is being taught in lab.