

Software for Intelligent Robotics

CS594, Section 30586

Fall 2002

Class web page: <http://www.cs.utk.edu/~parker/Courses/CS594-fall02.html>

Instructor: Prof. Lynne E. Parker

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Office Hours: Tuesday/Thursday after class until 6:00, or by appointment (send email)

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Office Hours: 2:35 – 3:35 Tuesday/Thursday, or by appointment

Time and Place: Tuesday/Thursday, 3:40 – 4:55, Claxton 205.

Course Description:

This course will provide an introduction to the key artificial intelligence issues involved in the development of intelligent robotics. We will examine a variety of algorithms for the control of autonomous mobile robots, exploring issues that include software control architectures, localization, navigation, sensing, planning, and uncertainty. This course does not assume any advance knowledge of artificial intelligence or robotics. Evaluation will be through homeworks (which will often include programming), exams, and a final project.

Textbook: *Introduction to AI Robotics*, by Robin Murphy, MIT Press, 2000. In addition, several required readings will be distributed in class that cover detailed material beyond the textbook.

Prerequisites: CS302 (or equivalent), CS311 (or equivalent), and strong programming skills, or permission of instructor. The programming assignments will be in C, and the robotic simulation system we will use runs under Solaris Unix. Students are expected to have sufficient prior knowledge of C and user-level Unix to complete the required homeworks.

Evaluation:

Grading will be based on homeworks, exams, and a final project as follows:

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|----------------|-----|
| Homeworks: | 25% |
| Exam 1: | 20% |
| Exam 2: | 20% |
| Final Project: | 15% |
| Final Exam: | 20% |

Final grades will be determined by overall average as follows:

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|-----|-----------|
| A: | 90 – 100 |
| B+: | 85 – 89.9 |
| B: | 80 – 84.9 |
| C+: | 75 – 79.9 |
| C: | 70 – 74.9 |
| D: | 60 – 69.9 |
| F: | 0 – 59.9 |

Class Policies:

- **Class attendance:** Class attendance will be taken, but will not be part of your course grade. However, you are responsible for all course material and announcements covered in class. A significant amount of material will be covered in class that is not in the textbook; you are responsible for all of this material. If you miss class, you must obtain the covered material from a willing classmate. Neither the instructor nor the TA will be available (during office hours or other times) to repeat material covered in class.
- **Collaboration Policy:** Discussing and exchanging ideas is encouraged. However, except if specifically allowed by the instructor, copying from any outside sources (e.g., fellow students, Internet, etc.) on any material to be graded is not permitted, and will be considered cheating. Cheating will result in failure of the class. Each student is responsible for securing his or her work from copying. Each student is expected to abide by UT's policies on Academic Conduct.
- **Due dates:** All assignments must be turned in at the very beginning of class on the due dates for full credit. Assignments turned in after they have been collected but before the end of class will receive a 20% penalty. No assignments will be accepted after class on the due date.
- **Exams:** All exams (including the final exam) will be one hour, in-class, closed book exams. The final exam will be comprehensive, covering material from the entire course.
- **Missed exams:** If you have an excusable absence from a test, your final exam grade may be counted as your missed exam grade. The instructor reserves the right to administer a make-up exam. Barring exceptional circumstances, you must contact the instructor to explain your absence within 24 hours of a missed exam. Otherwise, the absence will be considered unexcused, and your grade for that exam will be 0. Talk to the instructor now if you have any foreseeable conflicts with the given exam dates.
- **Grading corrections:** Bring any grading correction requests to the instructor within 2 weeks of receiving the grade, or before the end of the semester, whichever comes first. After that, your grade will not be adjusted. If you find any mistake in grading, please let the instructor know. Your grade will not be lowered.
- **Announcement responsibilities:** Important announcements, schedule revisions, etc., will be posted to the class email list. You are responsible for information distributed to this email list.
- **Special class meeting times:** Due to research-related travel by the instructor, class will not be held on September 26th and October 1st. HOWEVER, these classes will be made up by meeting longer on September 24th and October 3rd. (See schedule below). *If you are unable to meet for the extended class times on these dates, please let the instructor know as soon as possible, and alternative arrangements will be made.*

Schedule:

Each student is responsible for any changes to the schedule that may be posted to the email list during the semester. Additional assigned readings will be given in class and posted to the web site.

| Date | Topics | Assigned Readings in Murphy | Homeworks |
|----------------------|--|------------------------------------|---|
| Thursday, 22-Aug | Course intro/overview. Introduction to robot simulator. | | Assigned: Homework 1 |
| Tuesday, 27-Aug | Big Picture: overview of issues and challenges in autonomous robotics | | |
| Thursday, 29-Aug | History of Intelligent Robotics | Chapter 1 | |
| Tuesday, 3-Sept | Hierarchical Paradigm and STRIPS | Chapter 2 | DUE: Homework 1 Assigned: Homework 2 |
| Thursday, 5-Sept | Biological Foundations | Chapter 3 | |
| Tuesday, 10-Sept | Robot Behavior | | |
| Thursday, 12-Sept | Behavior-Based Paradigm: Part I | Chapter 4 | DUE: Homework 2 |
| Tuesday, 17-Sept | Behavior-Based Paradigm: Part II | | |
| Thursday, 19-Sept | EXAM 1 | | |
| Tuesday, 24-Sept | Designing Behavior-Based Systems | Chapter 5 | Assigned: Homework 3 Assigned: Final Project |
| | ** Class meets from 3:40 – 6:10, as makeup for Sept. 26 | | |
| Thursday, 26-Sept | No class; makeup class on Tuesday, 24-Sept. from 4:55 – 6:10 PM | | |
| Tuesday, 1-Oct | No class; makeup class on Thursday, 3-Oct. from 4:55 – 6:10 PM | | |
| Thursday, 3-Oct | Sensing | Chapter 6 | |
| | ** Class meets from 3:40 – 6:10, as makeup for Oct. 1st. | | |
| Tuesday, 8-Oct | Representational issues for behavioral systems; | | DUE: Homework 3 Assigned: Homework 4 |
| Thursday, 10-Oct | No class – Fall break | | |
| Tuesday, 15-Oct | Hybrid deliberative/reactive | Chapter 7 | |
| Thursday, 17-Oct | Adaptive behavior: Part I | | DUE: Homework 4 |

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| Tuesday, 22-Oct | Adaptive behavior: Part II | | |
| Thursday, 24-Oct | EXAM 2 | | |
| Tuesday, 29-Oct | Multi-Robot Systems: Part I | Chapter 8 | Assigned: Homework 5 |
| Thursday, 31-Oct | Multi-Robot Systems: Part II | | |
| Tuesday, 5-Nov | Navigation: Part I | Chapter 9 | |
| Thursday, 7-Nov | Navigation: Part II | | Due: Homework 5 |
| Tuesday, 12-Nov | Path Planning: Part I | Chapter 10 | |
| Thursday, 14-Nov | Path Planning: Part II | | |
| Tuesday, 19-Nov | Localization and Mapping: Part I | Chapter 11 | |
| Thursday, 21-Nov | Localization and Mapping: Part II | | DUE: Final Project |
| Tuesday, 26-Nov | Future directions; Q/A for final exam | Chapter 12 | |
| Thursday, 28-Nov | No class – Happy Turkey Day! | | |
| Tuesday, 3-Dec | FINAL EXAM | | |