Introduction

Welcome to CPS 196.2: Robotics\(^1\). One objective of this course is to use a hands-on approach to introduce the basic concepts in intelligent control, focusing on mobile robots and illustrations of current state of the art research and applications. Students will read about various approaches to mobile robotics and implement intelligent control algorithms for selected domains. The other goal for the course is to experiment with robot kits, build cool and possibly useful electronic artifacts, and have fun.

This Computer Science elective course is a seminar that satisfies the Junior/Senior Small Group Learning Experience requirement.

**Professor:** Jeff Forbes, D235 LSRC, 660-6550, forbes@cs.duke.edu
Office Hours: MW 2:15-3:30, whenever my door is open, or by appointment

**Undergraduate Teaching Assistant:** Shashi Mudunuri, skm9@duke.edu
Office Hours: T,Th 7pm-8 Room TBA

**On-line Resources**

The course home page will provide one-stop shopping for course information. All the handouts, homework, labs, staff contact information, etc., will be posted there. The URL is

http://www.cs.duke.edu/courses/fall02/cps196.2/

The course newsgroup is duke.cs.cps196.2. For most questions about the course, the newsgroup is the right place to ask them.

\(^1\)This course may not be particularly well named. First, the course only deals with mobile robots. Secondly, the material more concerns the issues of control in agents as opposed to anything particularly concerning robots. The application domain for some of the control algorithms will be robots however.
Course Materials


Optional:

There will be various supplemental readings given out in class and linked to the resources page that will be required as well.

**Background Knowledge**

The only listed prerequisite for this course is CPS 100. The projects will require a reasonable amount of programming and debugging proficiency, so having taken a course like CPS 108 would certainly be useful. If you find the class overwhelming at the beginning, you should talk to the professor. The more important requirements are the willingness to work independently and on teams for a significant period of time on projects, some engineering aptitude, and a bit of creativity.

**Homework and Programming Assignments**

**Readings**

Throughout the semester I will assign readings from the texts, papers, and webpages. You are expected to have these readings completed before the class on the day that it is due so that you can participate in discussion. There will be questions associated with the various readings. You will turn in the answers to these questions online.

A midterm and final exam will also test on the lecture and reading material.

**Assignments**

There will be a number of assignments/projects working with real and simulated robots. The assignments are:

1. Robocode
   (a) Getting started
   (b) Roboleague shootout
2. LEGO Tankbots
   (a) Building a robot and using LegOS
   (b) Sensors, actuators, and reactive control
3. Webots/Khepera
(a) Building a simulated Khepera
(b) Swarms and multi-agent coordination

4. Meet Markov!

The following robotic platforms will be used in the course:

- LEGO MindSTORMS
- K-Team Khepera
- iRobot ATRV Jr.

Additionally, students will work with simulated robots in the Robocode and Webots domains.

**Final project**

Groups of students will complete a final project over the final third of the course of their own choosing. Students will publicly demonstrate their robots. More details will come later.

**Tentative Grading Scheme**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments/Projects</td>
<td>35%</td>
</tr>
<tr>
<td>Reading Writeups</td>
<td>10%</td>
</tr>
<tr>
<td>Midterm</td>
<td>10%</td>
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<tr>
<td>Final project</td>
<td>30%</td>
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<tr>
<td>Final exam</td>
<td>15%</td>
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</tbody>
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**Policy on Collaboration and Cheating**

Collaboration is encouraged in this course. The course staff encourages you to use the course newsgroup wherever possible to discuss any problems you may be having. Nevertheless, all work you turn in must be your own. Furthermore, we expect all members of groups to contribute to all assignments.

Both the midterm and the final will be open book, open note tests.

**Late Policy**

Reading assignments turned in after the deadline will receive no credit. Please do not beg and plead for exceptions; an individual reading writeup is worth too few points to justify any groveling (a comment that probably applies to individual test questions, as well). You can miss an assignment or two and still get your A+. If some personal crisis disrupts your schedule one week, don’t waste your time and ours by trying to fake it; just be sure you do the next week’s work on time.

On the robot assignments, there is some leniency. If an assignment is $N$ school days late, I’ll penalize it $10N$ percent. All assignments turned in more than a week late receive no credit.