CS 7630: Autonomous Robotics

Spring 2014
Architecture (East) 207
Tuesday, Thursday 9:35AM-10:55AM

Instructor: Prof. Ronald C. Arkin
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Course Description

1. Prerequisite: CS 3600 or equivalent or instructor's permission

A survey of autonomous robotics as viewed from a variety of disciplines and as applied in artificial intelligence. Neuroscience and cognitive psychology are studied as a source of paradigms for machine autonomy. Various cybernetic issues will be explored from a multi-disciplinary vantage point. High-level computer vision and other sensor modalities and their application to intelligent robotics will also be studied within this context.

2. Class structure

The subject matter of this course is often controversial and hopefully equally stimulating. It is a goal to have lively discussions with various interpretations of the subject matter. We are dealing with approaches to problems that will hopefully provide solutions in extremely difficult task domains. Consequently your classroom participation is essential.

There will be two meetings per week (Tuesday and Thursday), starting **promptly** at 9:35. Your attendance, of course, is mandatory as is your participation in classroom discussions.

You are required to complete all assigned readings *prior* to class and you must be prepared

to present or discuss the material contained herein.

3. Student evaluation (grading)

As mentioned earlier, classroom attendance and participation are crucial to passing this course. You will be evaluated after each class regarding your contributions to the discussion and your knowledge of the subject matter derived from the readings (10%). In addition, there will be at least one presentation involving each student on material relevant to the course (20%). The remainder of your grade will be derived from a term project and homework (30%), and the midterm (20%) and final exam (20%).

Students are expected to **adhere to the Honor Code** in this class. **All work is to be accomplished independently unless expressly stated in writing otherwise** (e.g., as in a team project). Do not plagiarize from any sources including the internet. Collaboration on other homework and/or take home exams is not permitted.

4. Readings

The texts for this course are: *Behavior-based Robotics*, (recommended) Arkin, MIT Press, 1998 and *Introduction to Autonomous Mobile Robots*, Siegwart and Nourbakhsh, (required) MIT Press, SECOND EDITION, 2011.

Available Robots for Project

Term Project

Course Syllabus

Date	Topic	Reading	Leader	Assignments
1/7	Introduction I (slides)	Chapter 1 (Arkin)	Arkin	
1/9	Introduction II	Chapter 1 (Siegwart)	Arkin	
1/14	**Mobile Robot Lab Tour – TSRB Basement**	MEET IN TSRB LOBBY @ 9:30AM Mason Paper	TSRB	
1/16	Animal Behavior	Chapter 2 (Arkin)	Arkin	HW #0 out
1/21	Robot Behavior	Chapter 3 (Arkin)	Arkin	
1/23	Behavior-based Architecture	Chapter 4 (Arkin)	Arkin	
1/28	Knowledge Representations	Chapter 5 (Arkin) Chapter 6	Arkin	HW #0 due

		(Siegwart)		
1/30	Hybrid Architectures	Chapter 6 (Arkin)	Arkin	
2/4	Perception/Non-vision Sensing	Chapter 7 (Arkin) Chapter 4 (Siegwart)	Arkin	HW #1 out
2/6	**Guest Lecture**	The ethics of creating "companions" for children Borenstein Paper	Dr. Jason Borenstein	
2/11	Robot Vision		Arkin	Homework #1 Due HW#2 out
2/13	Adaptive Behavior	Chapter 8 (Arkin)	Arkin	
2/18	**Guest Lecture**	Deep Learning in Robotics Paper	Dr. Zsolt Kira	
2/20	MIDTERM EXAM		---	Homework #2 Due
2/25	Probabilistic Robotics (SLAM)	Chapter 5 (Siegwart)	Student	
2/27	Autonomous Driving – DARPA GC/Google		Student	
3/4	Roboethics (Possible Guest lecture)		Arkin	Term Project Abstract Due
3/6	Developmental Robotics		Student	
3/11	Humanoid/Android/DARPA RC		Student	
3/13	Teleautonomy/Planetary Rovers		Student	
3/18	SPRING RECESS		----------	
3/20	SPRING RECESS		----------	
3/25	**Guest Lecture: Modeling People for HRI**		Dr. Alan Wagner	
3/27	**Guest Lecture: HRI Models for trust, deception, etc.**		Dr. Alan Wagner	
4/1	Multirobot Systems	Chapter 9 (Arkin)	Arkin	HW #3 out
4/3	Swarm Robotics		Student	
	Field Robotics (Agriculture,			

4/8	Construction, etc.)		Student	
4/10	Fringe Robotics	Chapter 10 (Arkin)	Arkin	HW #3 due
4/15	Entertainment Robotics		Student	
4/17	Health Care Robotics		Student	Term Project Due
4/22	Project Presentations		Student	
4/24	Project Presentations		Student	Take-home Final Exam out.

* Denotes student presentation

Subject to change

(Arkin) = *Behavior-Based Robotics*, MIT Press 1998.

(Siegwart) - *Introduction to Autonomous Mobile Robots*, Siegwart, Nourbakhsh, and Scaramuzza, 2nd Edition, MIT Press, 2011.

Links

The Mobile Robot Laboratory homepage
MissionLab software home page
TeamBots software home page
Borg Lab
RIM@GT