CS 378: Autonomous Intelligent Robotics
FRI II

Instructor: Justin Hart

http://justinhart.net/teaching/2017_fall_cs378/

Today

- Basic Information, Preliminaries
- Course Overview
- Course Projects
- Grading
- Project Inspiration, Ideas, and Discussion

Basic Information

- Lectures (on lecture days): RLM 7.116
- Laboratory (on laboratory days): GDC 3.414
- Website: http://justinhart.net/teaching/2017_fall_cs378/

Basic Information

- Syllabus: Handouts and available on website
- Media Release: If you do not sign one, please do not appear in media representing or hosted with course content.

Office Hours / Contact / Mentors

Instructor

- Office: GDC 3.402
- Email: hart@cs.utexas.edu
- Office Hours: TBD / By appointment

Mentors (office hours TBD)

- Kathryn Baldauf
- Ricardo Delfin Garcia
- Nathan John
- Ashay Lockhande
- Rishi Shah
- Benjamin Singer
- Nick Walker
- Victoria Zhu

Students with Disabilities

The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities.

To determine if you qualify, please contact the Dean of Students at 471-6529; 471-4641 TTY.

I will work in conjunction with you and them to make appropriate arrangements.

Attendance and Participation

Students are expected to attend every class session and to actively participate. This includes in-class discussions and effective use of laboratory time to pursue semester projects.

If you miss a session, it is your responsibility to find out what you missed, including in-class announcements.

Academic Integrity

Cheating, plagiarism, and other academic misconduct will be handled according to UT's guidelines.

http://www.cs.utexas.edu/users/ear/CodeOfConduct.html#honesty

Last Semester – FRI I

- Lecture-based
  - Regular CS-style homework assignments
  - Learning ROS
- Introduces students to robotics research concepts.
  - Working with robots
  - Student final projects.

This Semester – FRI II

- Students participate as members of a laboratory
- More akin to what a PhD student does than what an undergraduate does
- Project-based & laboratory-based

This is unlike your other classes

- Typically
  - Homework is assigned
    - The professor knows the answer in advance
    - It is your job to implement a known solution

This is unlike your other classes

- Research
  - Starts with a question
    - Investigate prior work on this question
      - Literature survey
    - Hypothesize
      - Evaluate known hypotheses or form new ones
    - Experimentation
      - Formulate and conduct controlled experiment.
    - Interpretation
      - Evaluate how experimental results affect your hypothesis and potential further work

This is unlike your other classes

You will be evaluated on the quality and quantity of the work that you put into your project, not its completion.

- Do you demonstrate an understanding of current research on your topic?
  - Literature survey
- Do your hypotheses make sense?
- Are your goals ambitious enough?
  - Are they attainable enough?
- Are you making progress towards an answer to a question or solution to a problem?

Hopefully, however, this will be rewarding

- Student publications
  - Generally **not** in the same term as the class
    - Svetlik, M., Leonetti, M., Sinapov, J., Shah, R., Walker, N., and Stone, P. (2017) **Automatic Curriculum Graph Generation for Reinforcement Learning Agents**. In *Proceedings of the 31st Conference of the Association for the Advancement of Artificial Intelligence (AAAI)*, San Francisco, CA, Feb. 4-9, 2017.
    - E. Short, J. W. Hart, M. Vu, and B. Scassellati. **No Fair!! An Interaction with a Cheating Robot.** In *Proceeding of the 5th ACM/IEEE International Conference on Human-Robot Interaction (HRI 2010).* Osaka, Japan, March 2010.
      - Nominated for best paper award.

Hopefully, however, this will be rewarding

- https://www.youtube.com/watch?v=-iaiRW3URto
- Appeared in
  - GE Focus-Forward
  - Google Solve for X
  - Tribeca
- An NSF grant based on this work was awarded
- There are still robot cheating papers every year at HRI

Project Organization

- Teams of about 3
  - Work on semester project together
  - If you have fewer people, you will be expected to put forth an effort equivalent to 3 people
  - If you have more people, you will be expected to work harder

Grading

- Class
  - Participation & Attendance – 20%
  - Final Project – 80%

Grading

- Final Project
  - Project Proposal, Writeup, & Presentation – 30%
  - Progress Report 1 – 10%
  - Progress Report 2 – 10%
  - Final Project Report – 25%
  - Final Project Presentation – 25%

Grading

- Final Project (Demonstration Option)
  - Project Proposal, Writeup, & Presentation – 30%
  - Progress Report 1 – 10%
  - Progress Report 2 – 10%
  - Final Project Demonstration – 10%
  - Final Project Report – 20%
  - Final Project Presentation – 20%

Choosing a Final Project

- Unlike last semester's projects, these projects will be structured as laboratory projects
- Will need to fit into the overarching goals of lab projects:
  - BWI
  - RoboCup@Home
- May be self-contained in the semester, lay groundwork for future research, or provide support to laboratory projects

Choosing a Final Project

- Ask the following questions:
  - Is my group prepared for this project?
    - Does it require training that we do not have?
    - Can we acquire that training this semester?
  - Is my project not ambitious enough or possibly too difficult to achieve?
    - What milestones can we achieve?
  - Does my project forward the fields of artificial intelligence or human-robot interaction?
    - Does it help the lab towards these research directions?

What to Expect

- Next few class sessions are lectures & preparation
- After that, mostly in laboratory
  - You are expected to attend
- During lab days
  - Team/supervisor meetings – ~20-30 minutes
  - Lab meetings
    - 5-minute progress reports from each team
  - Lab work time
- You are expected to work on your projects outside of this time as well
- Mentors & I will be available during office hours

Building-Wide Intelligence

- Enhance Human-Robot Interaction (HRI)
  - Add a face to the robot
  - Change the interface so the obvious interface is on the front
    - Improve start-up and remote access capabilities
- Manipulation & navigation improvements
- Infrastructure, computational, and remote-access improvements

RoboCup@Home

- Domestic Standard Platform League
- Domestic service robots scored on their performance of a set of tasks


RoboCup@Home League
Domestic Standard Platform
Hibikino-Musashi@Home SPL
eR@sers
UT Austin Villa
2
1
3
RoboCup 2017
Nagoya Japan
RoboCup 2017
Nagoya Japan
ロボカップ2017名古屋世界大会
27 to 30 JULY
RoboCup 2017
Nagoya Japan
RoboCup 2017
Nagoya Japan
ロボカップ2017名古屋世界大会
27 to 30 JULY

RoboCup@Home

Goal

Win RoboCup@Home in 2018

RoboCup@Home Tasks – Stage 1

- Storing Groceries
  - Groceries are placed on a table
  - Stack them onto a shelf
  - Place similar items together
- Speech & Person Recognition
  - Listen to a question
  - Turn towards the person asking the question
  - Answer the question

RoboCup@Home Tasks – Stage 1

- General Purpose Service Robot
  - Operator gives the robot an instruction in English
  - Robot is to perform the operator's request
- Help Me Carry
  - Operator asks for help carrying groceries
  - Operator leads the robot to a car
  - Operator hands bag of groceries to robot
  - Robot brings groceries to kitchen
  - Robot asks person in apartment for help
  - Robot leads this person to the car

RoboCup@Home Tasks – Stage 2

- Restaurant
  - Robot performs as a waiter in a restaurant, taking orders from patrons, telling them to kitchen staff, and delivering meals
  - Robot has not been in this restaurant before, and can not have a pre-programmed map of it
- Prepare a meal and clean it up
  - Robot sets a table, places a meal on the table, and cleans it up after a judge eats the meal. The judge chooses the meal.

RoboCup@Home Tasks – Stage 2

- Enhanced Endurance General-Purpose Service Robot
  - Same as in Stage 1, but much more difficult verbal requests.
- Open Challenge
  - Whatever each lab wants to present

http://www.ideacity.ca/video/justin-hart-self-awareness-robots/