CS491X/691X/791X: Special Topics: Robotics and Mobile Sensor Networks

Fall 2015

Course Information

- Lectures: Mon, Wed 2:30pm-3:45pm
- Place: CFA18
- Office hours are:
  - Tuesday 10:00-11:00AM, Thursday 10:00-11:00AM.
  - Or, make an appointment before you come.
- Instructor: Dr. Hung (Jim) La
- Email: hla@unr.edu
- Phone: 775-682-6862
- Office: SEM214
- Course homepage: I will put related course materials on this course homepage.

Goals

This course is designed to:

- Provide you the current state of the art of the mobile sensor networks research.
- Help you learn and apply research methods commonly used in MSNs
- Understand basic sensor localization, fusion and control techniques

Tentative Topics

- Topic 1: Introduction to mobile sensor networks (MSNs)
- Topic 2: Hardware and software platforms for MSNs
- Topic 3: Introduction to networking and wireless communication
- Topic 4: Sensor Localization and Navigation
- Topic 5: Multi-sensor Fusion
- Topic 6: Consensus Filters
- Topic 7: Cooperative Control, Learning and Sensing in MNSs
- Topic 8: Other advanced topics possible…

Grading Policy

- Component Percentage
  - Homework 15%
  - Paper Presentations 20%
• Project 1  30%
• Project 2  30%
• Attendance  5%

• Grade Scale
  • 90– 100  A
  • 80 - 89  B
  • 70 – 79  C
  • 60 – 69  D
  • < 60  F

**Homework**

• Some of your homework assignments will be to write critiques of assigned papers. The critiques must:
  • summarize the main contributions of the paper
  • identify the key arguments made by the authors
  • point out weaknesses if any
  • propose ways to improve/extend/build on their work

**Paper Presentation**

• Students will make paper presentations. Paper is usually from a list of suggested papers/topics. You can also select a different paper other than those on the list, but you need talk to the instructor first. You are very encouraged to re-implement the paper (option).
• The audience is encouraged to participate. Make comments, ask questions, answer questions, argue!

**Project 1. Sensor Fusion for Robot Localization**

Given the data collected by the real/physical Novatel DGPS, Microstrain IMU 3DM-GX2, and Seekur robot encoders, the students will be asked to design and implement the Kalman filter to fuse GPS, IMU and Wheel Encoder data to output a smooth and more accurate pose (position and orientation) of the robot.

**Project 2. Consensus Filters for Sensor Networks**

The students will be asked to design and implement two different consensus filters: Average Consensus and Weighted Average Consensus. Analyze the convergence of these consensus filters and apply them to build a map of the scalar field using a MSN.

**Academic Dishonesty**

Students are encouraged to study together, however each student must individually prepare his/her solutions. Cheating, plagiarism or otherwise obtaining grades under false pretenses constitute academic dishonesty according to the code of this university. Academic dishonesty will not be tolerated and
penalties can include canceling a student's enrollment without a grade, giving an F for the course or for the assignment. For more details, see the University of Nevada, Reno General Catalog.

**Disability Services**

Any student with a disability needing academic adjustments or accommodations is requested to contact the instructor or the Disability Resource Center (Thompson Building, Suite 101) as soon as possible to arrange for appropriate accommodations.

**Academic Success Services**

Your student fees cover usage of the Math Center (784-443 or www.unr.edu/mathcenter), Tutoring Center (784-6801 or www.unr.edu/tutoring-center), and University Writing Center (784-6030 or http://www.unr.edu/writing-center). These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign of a responsible and successful student.

**Audio and Video Recording**

Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.