Fall 2005

EE/CPE 440A: Introduction to Autonomous Mobile Robots

Instructor: Professor Yan Meng
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Office Phone: (201) 216-5496
Office Hours: TBD
Lecture Time: Tuesday 10:00AM – 12:50PM
Lecture Location: Burchard 205
Course Website:
http://www.ece.stevens-tech.edu/~ymeng/courses/robotics/CPE440A.htm

Pre-requisite:

While not required, a familiarity with matrix algebra, calculus, and probability theory will be much helpful.

Textbook:

Roland Siegwart and Ilah Nourbakhsh, ***Introduction to Autonomous Mobile Robots***, MIT Press, April 2004, ISBN# 0-262-19502-X.

Some reading materials will be distributed in class.

Recommended readings:

1. Robin Murphy, ***An Introduction to AI Robotics,*** MIT Press, November 2000. ISBN 0-262-13383-0.
2. Thomas Braunl, ***Embedded Robotics: Mobile Robot Design and Applications with Embedded Systems***, Springer-Verlag Berlin Heidelberg New York, ISBN# 3-540-03436-6.
3. David A. Forsyth and Jean Ponce, ***Computer Vision: A Modern Approach***, Prentice Hall, 2003, ISBN# 0-13-085198-1.
4. David Kortenkamp, R. Peter Bonasso, and Robin Murphy, ***Artificial Intelligence and Mobile Robots Case Studies of Successful Robot Systems,*** MIT Press, March 1998, ISBN 0-262-61137-6.
5. H. R. Everett, ***Sensors for Mobile Robots: Theory and Applications***, A.K. Peters Ltd, 1995, ISBN 1-56881-048-2.

Course Descriptions:

This course will offer the students an overview of the technology of intelligent robot systems -- the mechanisms that allow an intelligent robot to move through a real world environment to perform its tasks - including locomotion, sensing, localization, and motion planning. Since the design of any successful

intelligent robot involves the integration of many different disciplines, among them kinematics, signal analysis, information theory, artificial intelligence, and probability theory. In order to reflect this, the course will discusses all facets of intelligent robotic system including hardware design, wheel design, kinematics analysis, sensors and perception, localization, mapping, and robot control architectures.

Course Schedule:

Lecture 1	Introduction: History of mobile robots
Lecture 2	Mobile robot locomotion
Lecture 3	Mobile robot kinematics and motion control
Lecture 4	Mobile robot perception: sensors
Lecture 5	Camera model and camera calibration
Lecture 6	Computer vision introduction
Lecture 7	Computer vision application in mobile robot systems
Lecture 8	Mobile robot localization (1)
Lecture 9	Mobile robot localization (2)
Lecture 10	Robot map building
Lecture 11	Mobile robot path planning and navigation (1)
Lecture 12	Mobile robot path planning and navigation (2)
Lecture 13	Mobile robot architectures
Lecture 14	Artificial intelligent robots

Grading:

HW and quiz 20%
Midterm and presentation 30%
Project assignments 20%
Final 30%