CSE 481C Capstone Software Design: Robotics

Credits

5.0 (3 hrs lecture, 2 hrs+ meeting times)

Lead Instructor

Maya Cakmak

Textbook

None

Course Description

Student teams design and implement a software project involving multiple areas of the CSE curriculum. Course emphasizes the development process, rather than the product.

Prerequisites

CSE 332; CSE 351; either CSE 331 or 371.

CE Major Status

Selected Elective

Course Objectives

The main goal of this course is to open up new career options in robotics for computer science and engineering students. To that end, the course will teach you the basics of robotics and give you implementation experience. You will learn to use libraries and tools within the most popular robot programming framework ROS (Robot Operating System). We will touch on robot motion, navigation, perception, planning, and interaction through mini-lectures, labs and assignments, eventually integrating these components to create autonomous or semi-autonomous robotic functionalities. The project will give you team-work experience with large scale software integration and it will get you thinking about opportunities for using robots to make people's lives easier. At the end of the quarter students are expected to:

- Understand basics of robot navigation, perception, planning, interaction; have a sense of challenging problems in robotics
- Know how to use important tools in ROS, be able to contribute to ROS, have awareness of available packages in ROS

- Be comfortable operating a robot platform, have experience using ROS tools to control a robot platform
- Understand the importance of interface design and robustness of functionalities in robotics
- Be prepared to interview for a robotics job

ABET Outcomes

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (H)
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors (H)
3. an ability to communicate effectively with a range of audiences (H)
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts (H)
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives (H)
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions (H)
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. (H)

Course Topics

- Need finding for technology-based solutions
- Building a lean business model for technology startups
- Sketching and storyboarding
- Robot Operating System
- Large scale software integration
- Robot navigation and localization
- Robot manipulation
- Robot perception
- CAD and fabrication basics