E160 – Autonomous Robot Navigation
Project

Introduction

1. OVERVIEW
The goal of this project is to have students explore, develop and implement a novel addition to the Pololu Romi Navigation system. Students will work in pairs to research new ideas and implement their ideas.

2. SAMPLE PROJECTS
Sample projects include:

- A* Motion Planning
- SLAM Implementation
- EKF Localization
- IMU Calibration and fusion into localization
- Multi-Robot Motion Planning
- Human following system
- Monocular Vision System
- Multi-Robot Communication
- Platooning control
- Stereo Vision system
- 3D Scanning System?
- Kinect Scanning System?

2. DELIVERABLES
There are four deliverables for this project:

2.1 Project Proposal
The project proposal must be 1 page in length and include the following:
- Title, Names, Date
- Mock image of navigation scheme (block diagram, hardware, etc.)
- 1 paragraph description of background research – with minimum 3 papers referenced and identification of the 1 paper that will be presented in the weeks that follow.
- 1 paragraph description of project
- Performance Metrics and measurable outcomes, plots that will appear in final presentation
- Milestones to be accomplished with dates.

The instructor will meet with student teams during lecture time on Wed. April 4th to discuss scope and a appropriateness of the proposed project.

2.2 Research Paper Presentation
Presentations will be 20 minutes long. The schedule will be released Saturday, April 7th. The presentation will be just about the paper, not your project. It should include:
- Motivation – why is this type of work useful in the world.
- Overview of key related work to set the context of the paper's contribution
- Problem Definition (what precisely is trying to be solved here, define mathematically if possible).
- Detailed description of the solution and key contributions of the paper (pseudo code, control law, proof,
- Results that verify the solution (include any plots, videos, quantifiable performance gains).
- Conclusions and Future Work

2.3 Final Project Presentation
Presentations will be 10 minutes long. A working demo must be presented. Performance data must be presented. A presentation template will be provided.

2.4 Project Website
The web page should be completed by Friday April 27th at midnight. It must contain a brief description of the project, links to at least one video demonstration, all content found in the final presentation, and links to presentations. It will be linked on the E160 web page and must be live for minimum 3 months.

3. DUE DATES

Deliverable	Due Date
Project Proposal	Midnight Friday, April 6, 2018
Research Paper Presentation	1:15pm Monday, April 9, 2018
Final Presentation	1:15pm Monday, April 27th, 2018
Web page	Midnight Friday, May 3rd, 2018

4. GRADING
The project is worth 25% of each student's final grade. Note that presentations will be peer-reviewed.

Deliverable	Percentage of overall Grade Points
Project Proposal	10%
Preliminary Presentation	10%
Final Presentation	70%
Web page	10%