EN530.603 Applied Optimal Control
Project
November 26, 2018

Prof: Marin Kobilarov

1 Overview

Our final homework will be equivalent to a mini-project chosen by you. The goal is to apply trajectory optimization and estimation algorithms learned during class to a practical problem. Various implementations of these robotic systems will be provided to you. You can either work individually or in a team of two students. The project timeline is given below:

Due Date	Task
11/27	Discuss project idea with TAs or instructor (e.g. during office hours on 11/26 or 11/27)
11/28	Give a 2-minute 2-slide project idea overview in class (upload slides before class)
12/14	Give a 5-minute 5-slide project presentation in class (during final exam time)
12/17	Submit a project report (maximum 3 pages)

Note: sign-up sheet for a 5-minute discussion on 11/27 can be found here

2 Suggested Projects

1. **Optimal Control**:
   (a) Robotic manipulator
   (b) Car model
   (c) Quadcopter model
   (d) Mobile manipulator (a manipulator mounted on a mobile robot)
   (e) Unmanned underwater vehicle (UUV)
2. **Estimation**:
   (a) Object shape estimation using noisy range measurements
      i. simple shapes: add dynamics, i.e. shape is moving
      ii. complex shapes: static estimation is OK, but think about optimally selecting next measurement location
   (b) Pose estimation of a wheeled ground vehicle using odometry and GPS data
   (c) Rigid body attitude estimation using Inertial measurement unit (IMU) measurements

3 Suggested Tools

1. ACADO
2. DDP
3. Gazebo Matlab Bridge (`https://github.com/jhu-asco/gazebo_rosmatlab_bridge`)

4 Exceptions

If you are absolutely not interested in implementation-related projects (e.g. Matlab, C++, etc...) then it might be possible to work on a theoretical problem, as long as it is related to the material and has significant depth. Please discuss with me such possibilities.