EN.530.626: Trajectory Generation for Space Systems
Final Project Guidelines

Project Description

As a part of the final project for this course, we encourage student groups of 2 - 3 per team to identify a suitable project topic of mutual interest in the areas of trajectory optimization and optimal control as applied to spacecraft and robotic trajectory planning. We strongly encourage students to formulate and work on this project through the course of the semester with assistance from the teaching team and, as possible, align the final project topic with their current research interests. At the end of the semester, students will present their topic to the class and submit a final project report.

Final Project Proposal: This project proposal should include details about:

1) A list of team members.

2) The research problem or system of interest that is the focus of the final project.

3) Details on the trajectory optimization, optimal control, or algorithmic tool of interest.

4) An implementation plan (i.e., programming language, interface/solver being used, custom implementation, etc.).

5) A list of possible benchmarks to compare against.

6) Any open questions the team may have on how to accomplish the work.

Final Project Report: The final project This report should be six pages long and written in LaTeX using the IEEE two-column conference template [1]. The project report should mirror a standard conference publication and include:

1) Introduction section discussing the motivation and problem statement.

2) Relevant work section discussing existing approaches to address this work and pertinent algorithms that have been studied in the plan.

3) Problem formulation section detailing the trajectory generation problem of interest and details on the algorithmic approach used.

4) Results section providing implementation details and a comparison against benchmarks where possible.

5) Conclusion section summarizing the work and identifying possible areas of future improvement and investigation.

6) A list indicating the contributions made by each individual team member on the project.

Project Deadlines

- September 16: form project groups of 2 - 3 students.

- September 25: submit the final project proposal.

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[1] https://www.ieee.org/conferences/publishing/templates

- December 2 and 4: final project presentations. Each team will present for approximately ten minutes with two minutes for questions.

- December 8: final project report due.

Example Topics

The instructor team is happy to provide feedback and guidance on suitable topics of interest. A few examples of appropriate project scope include:

1. Developing new solvers in `jax`, e.g., an iterative LQR solver [1], [2] or a custom branch-and-bound solver leveraging our class QP solver [3].

2. Applying trajectory optimization towards an application in your domain of interest, e.g., for a robot arm or a soft robotic system.

3. Leveraging the automatic differentiation to find connections between optimal control and machine learning [1], [2].