EN.530.626: Trajectory Generation for Space Systems
Homework 2
Due Oct 7th 11:59PM

The code for this assignment can once again be found on GitHub at this link and can be downloaded by running `git clone https://github.com/JHU-ACEL/trajdesign_hw.git` from a terminal window. You can either clone/download the repository out or simply `git pull` if you had cloned out the repository for the last homework. Homework submissions and grading will be managed through Canvas.

Introduction

This homework will focus on the following technical concepts:

1. Using Newton method to solve convex quadratic programs with linear equality and inequality constraints.
2. Synthesizing a primal-dual interior point method algorithm to satisfy the necessary conditions of optimality for such problems.

To accomplish this, the software development learning goals include,

- Implementing the primal-dual interior point solver using `jax`.
- Understanding how such generic QP solvers are used to solve optimal control problems.

Problem 1: A Vanilla Convex QP Solver

In this problem, we will be implementing the quadratic program solver from [1]. There is no additional write-up required for this problem.

Problem 2: Optimal Control as a Quadratic Program

Next, take the "vanilla" quadratic program solver from Problem 1 and use it solve a simple optimal control problem for a 2D spacecraft double integrator system. There is no additional write-up required for this problem.

Submission Instruction

- Download the marimo notebook for each problem and join them together into a single PDF or HTML file named `hw2.pdf`.

- Compress the `hw2` folder containing your python files. Name this file "hw3.zip".
- Upload both the PDF/HTML file and the zip folder into the canvas assignment "`Homework 2`".

References

[1] J. Mattingley and S. Boyd, "CVXGEN: A code generator for embedded convex optimization," *Optimization and Engineering*, vol. 12, no. 1, pp. 1–27.