Problem Set 3

Introduction

Like the last set, this set is mostly in a Jupyter notebook, although one section requires editing some raw Python in a separate file. If you'd like you can take a quick look at a static .html version of this notebook (set_3/set_3_copy_blank.html).

Download the notebook in a .zip

Download here a .zip with the notebook and a couple helper files (set_3.zip)

How to do this Problem Set

First make sure you've gone through the install instructions (install_drake_docker.html) for Drake + Docker. If you successfully completed Problem Set 2, then you should already be set!

You should be able to entirely write any math, text, and code in the notebook for your submission. We encourage you to add additional cells for each of these (more markdown, and more code cells)! Don't need to only use the provided cells.

To run the notebook, do this. (Make sure to have the notebook script in your terminal's working directory, and specify the path to the `set_3` unzipped folder)

```
## or use the notebook script for your system
./docker_run_notebook.sh drake-20190305 /path/to/set_3
```

For example if you have the `set_3` directory in the same parent directory as the `docker_run_notebook.sh` script, you can run:

```
## or use the notebook script for your system
./docker_run_notebook.sh drake-20190305 set_3
```

In the last part of this Problem Set, you will be asked to do Sum-of-squares optimization to find the Lyapunov function verifying the stability of a wheel pendulumn. In order to get you familiar with the optimization tools inside drake, we include a tutorial named `mathematical_program_and_sos_example.ipynb`. Hopefully this will help prepare you as you expand your toolkit or at least give you practice, building up to the final project for the class.

How to submit this Problem Set

We will use Gradescope to grade the problem set. Information for how to access Gradescope for the class is on the Piazza forum. (Although all course content is open, we only do grading for officialy enrolled students at MIT.)

Please note that you need to make **two** submissions for the problem set.

Those two submissions are:

1. **Autograded submission**
   - Upload `set_3.ipynb`, `inertial_pendulum_plant.py`, and `inertial_pendulum_plant_visualizer.py` to "Problem Set 3, Code Submission" on Gradescope. Don't forget to upload all three of them! (The first two will contain your modifications, while the visualizer file can be exactly the same as the file we supply you with.)
   - In our testing, Gradescope will give you a grade within around a minute. You can resubmit as many times as you'd like before the deadline -- but be sure to give yourself plenty of time before the deadline to iron out any issues. If you have any trouble, ask on Piazza and we're happy to help you out!
2. **Manually graded submission**
   - In your Jupyter notebook, go to File --> Print Preview
   - Verify that any plots you'd like to show, or images you want to show, are rendered in the notebook. If they're not, try going back and running those cells in the notebook.
   - "Print" this Print Preview, but actually save it to a .pdf, as set_3.pdf
   - Upload your set_3.pdf to "Problem Set 3, PDF Submission" on Gradescope.

- *Note: don't File --> Download as --> PDF straight from your Jupyter notebook. This has issues including plots!*

Please carefully follow the directions for each submission.

Good luck and have fun!

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