AA279C Homework 5

Due Friday, June 1, 2018

1 Attitude Regulation

Design a controller to hold a specified attitude. You can use any control design method you like, including LQR, PID, or pole-placement techniques like like the root-locus method. Document this design process and the choices you made. Finally, integrate the controller with the rest of your spacecraft simulation (i.e. you should feed the state estimate from your MEKF into the controller). I recommend the ODEHybrid MATLAB library for performing your simulations. You should document the following tests:

1. Test the controller from several random initial conditions out to $\pm 90^\circ$ error and document its performance.

2. Simulate the controller for several orbits with environmental disturbances and sensor noise. What is the RMS pointing error?

2 Eigen-Axis Slew

Implement an algorithm that generates state and input trajectories for an eigen-axis slew maneuver between specified initial and final attitudes with a specified maneuver time. Use the versine method described in class and use inverse dynamics to calculate actuator torques. To track this nominal trajectory in the presence of disturbances, use a linear feedback controller of your choice. Simulate the closed-loop system with state estimates from your MEKF and your full spacecraft dynamics. Document the following:

1. Test your algorithm by simulating a 180° slew maneuver. Be careful not to exceed the capabilities of your spacecraft's actuators during the maneuver. Plot the nominal and closed-loop states and control inputs and analyze the performance of the system.

2. Compare the the eigen-axis slew with the regulator controller. What differences do you see for initial conditions far away from the desired attitude?