

Project Outline ME497DGD

Due: any time before final

Instructor: Geir E. Dullerud

Objective

The goal of the project is to apply a subset of the course synthesis techniques to design controllers for an experimental setup. The nominal experiment for the project is the double inverted pendulum in the Everitt Controls Laboratory, and your goal will be to stabilize the pendulum.

Teams

You can work in teams of two, or individually.

Procedural overview

The first step in the project is to successfully design a state feedback H_2 controller using LMI synthesis software. Once this has been successfully completed, an H_∞ controller should be attempted incorporating some uncertain dynamics into the setup.

Use the following sequence:

- Derive a model for the pendubot; linearize the model; obtain the system parameters from Dan Block.
- Create a Simulink simulation environment for both your linear and nonlinear models, including a state space controller in the loop.
- Design and test controller in simulation.
- Implement and evaluate controller on experimental testbed.

We will discuss design formulation in lecture.

Project writeup

Provide a basic explanation of your design procedure including plots of relevant responses for the linearized equations, the nonlinear equations, and finally the closed-loop experiment. We will schedule a meeting in the lab to informally evaluate all the teams' controllers.