Edward Venator

EECS 304 Spring 2012

Frequency Domain Design Project

# Introduction

In this project, we were given a plant representing the yaw control system of a wind turbine. The system, which had the transfer function

had to be controlled with two different controller topologies to achieve 2% settling in 2 seconds from a step response with less than 60% overshoot. The first topology was a two-pole, two-filter design. The second topology was a PID controller with a built-in low pass filter.

# Methodology

For the two-pole, two-zero controller, I used MatLab's rltool and manually moved the poles and zeros until the root locus showed that it would be possible to achieve a fast controller with relatively high damping. I then selected a gain using the root locus.

For the PID controller, I began with the "optimal" PID controller generated by rltool. I found that this controller was more conservative than necessary, and tweaked the gains to make a more aggressive controller that would bring the output to with 2% in 2 seconds.

# Results

## 2 Pole/2 Zero Controller



Root locus With Poles and Zeros Open Loop Bode Diagram with Margins



Closed loop Bode plot (BW = ~4 rad/s)









## PID Controller



Root locus With Poles and Zeros Open Loop Bode Diagram with Margins



Closed Loop Bode plot (BW = ~2.5 rad/sec)









# Comments and Conclusions