

Department of Mechanical Engineering
Massachusetts Institute of Technology
2.14 Analysis and Design of Feedback Control Systems
Fall 2004
Assignment 6
Case Study on Ship Roll Control
Class Discussion Monday October 25, 2004
Assignment Due Friday October 29, 2004 by 4pm @ 35-231

This assignment will have 2 parts.

Part 1- Case Study Discussion

The first part of the assignment is your participation in the Monday discussion. We will expect everyone to participate, and will call on those who do not volunteer. The most important requirement for Part I is that you read the case study and look at the web references.

In addition there are three specific questions you must be prepared to answer:

Q1- Model Parameters

For the roll dynamics transfer function we will develop, what are reasonable parameter values? We will try to model the Queen Elizabeth II cruise ship. Data on the size and mass of this ship can be found on the web. (If all else fails, you can use the Queen Mary II that weighs 150,000 Tons, is 145 feet wide, extends 200 ft above the waterline and is 1,150 feet long. But, the QEII is smaller and there is a reason we want to use it.)

Q2 – Stabilizer Fin Sizing

At some point, we need to pick a specific fin size from those offered by the vendors such as Sperry. What factors will enter this decision and how will they affect our control system performance? Be prepared to be quantitative as well.

The second part is a written assignment.

Q3 – Disturbance Modeling

How would you quantify the disturbance from turning? How would you quantify the disturbance from wave motion? What factors will determine the intensity and frequency of these disturbances?

Since there is not much time, you need only concentrate one of these questions before Monday. Please locate your name here and be prepared to discuss the question you have been assigned:

Part 1 Question Assignments

Andrew Baines	Q1	Jason Martinez	Q2
,Marcos Berrios	Q1	Dan McCarthy	Q2
Christina Bonebreak,	Q1	Kyle McKenney	Q2
John Brewer	Q1	Justin Moore	Q2
ChrisDi Biasio	Q1	Elliott Ortiz-Soto	Q3
GregFonder	Q1	David Quinn	Q3
Justin Fox	Q1	John Rebula	Q3
Jonathan Hopkins	Q1	Josiah Rosmarin	Q3
Neera Jain	Q2	Jeremy Schwartz	Q3
Aparna Jonnalagadda	Q2	Spencer Szczesny	Q3
Shira Lee	Q2	Wang,Qi	Q3
Kartik Mangudi Varadarajan,	Q2		

Part II Controller Design

The second part, due in written form on Friday October 29, will be a documented controller design for the stabilization system using the model developed in class. For this design the expectations are that you will :

1. Start with a set of clearly stated performance specifications based on our Monday discussion.
2. Justify the model again based on your understanding of the model we develop together.
3. Using the Evans Root Locus method, determine a controller design or designs that will come closest to meeting these specs.
4. Perform a confirming disturbance-response simulation to demonstrate the performance of your design(s).
4. Comment on the practicality of your design.

Any questions, please email me @ Hardt@mit.edu