Designing Control Systems

The Big Ideas:	• Poles and System Abstraction are powerful tools for designing control systems. • Working with LTI systems means we can make generalizations like poles and Black's formula.

Introduction

Last week, we talked about poles and how to solve for them. We reviewed our signals and systems representations, and introduced the idea of looking at indicators for long-term behavior.

This week, we look at how to put all the components of this unit together. We'll model complex systems by breaking them down into smaller systems and combining them. Then we'll solve for the poles of those complex systems and use them to predict long-term behavior. We can also look at a plot of poles in our system to discover how changing parameters of a small part of a complex system affects the overall behavior of that system.

Vocabulary

In order to engage the material, be able to communicate about the topic with others, and in particular ask questions, we encourage familiarity with the following terms:
(at this point, you've probably noticed that terms get re-listed over multiple weeks. Think about how those terms relate to this week's material).

Theory

- Design
- Control System
- Equivalent System
- Dominant Pole

Practice

- Unit Sample Response
- Step Response
- `sf`
    - `Cascade`
    - `Parallel`
    - `FeedbackSubtract`
    - `FeedbackAdd`

Check Yourself

After this week in 6.01, you should be familiar with the following:

Theory: you should understand:

- The power of Signals and Systems as a knowledge representation.
- The basics of how to design a control system.

Practice: you should be able to:

- Make controllers for the robot that use signals from previous timesteps.
- Modify parameters in a control system design to obtain desired outcomes.
- Complete problems from previous years' Midterm 1 in a timely manner.

Resources

Theory: 5.4-5.7 of the 6.01 Course Notes is relevant to this week. All of Chapter 5 is relevant to this unit.

Practice: Practice problems are available in section 5.8 of the 6.01 Course Notes.

6.01SC Introduction to Electrical Engineering and Computer Science

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