Linear Time-Invariant Signals and Systems

The Big Ideas:	- Definition of Linearity "double the inputs == double the outputs" "sum of the inputs == sum of the outputs" - The equivalence of different representations of LTI, and how to convert between them

Introduction

Last week, we demonstrated the versatility of state machines, and introduced signals and systems. This week, we'll focus on Linear Time Invariant Systems. We'll be able to represent LTI systems using state machines, and introduce other ways to represent LTI systems. We determine a system is LTI, because it allows us to use things we know about LTI to analyze and predict the behavior of the 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

- Linear Time Invariant System
- Difference Equation
- System Block Diagram
- Operator Equation
- System Function

Practice

- `class SystemFunction`
- `Gain`
- `Cascade`
- `Delay`
- module `SM`
    - `Gain`
    - `R`
    - `Parallel`

Check Yourself

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

Theory: you should understand:

- What makes a system LTI and why we want to identify them

Practice: you should be able to:

- model complex systems by breaking them down into smaller systems
- model smaller systems using difference equations/block diagrams

Resources

Theory: The LTI part of Chapter 5 of the 6.01 Course Notes is relevant to this week. All of Chapter 5 is relevant to this unit.

Practice: The 6.01 Software Documentation will come in handy, in particular modules `sf` and `sm`. You may want to take a look at `ltism`.

6.01SC Introduction to Electrical Engineering and Computer Science
Spring 2011