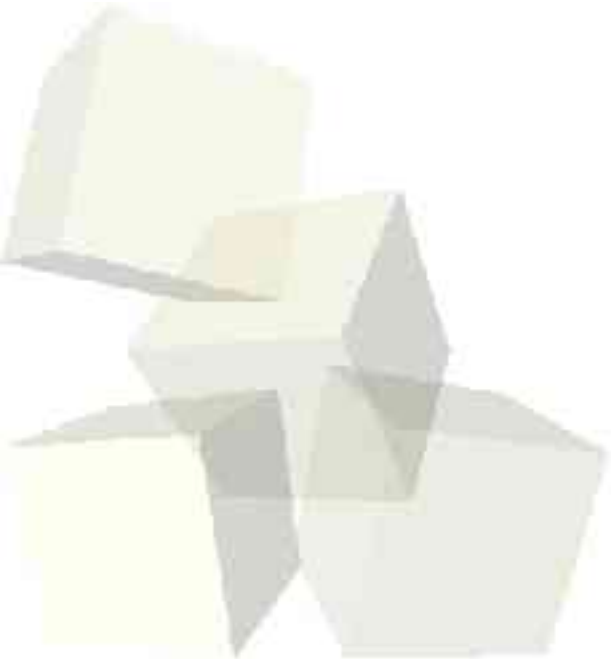
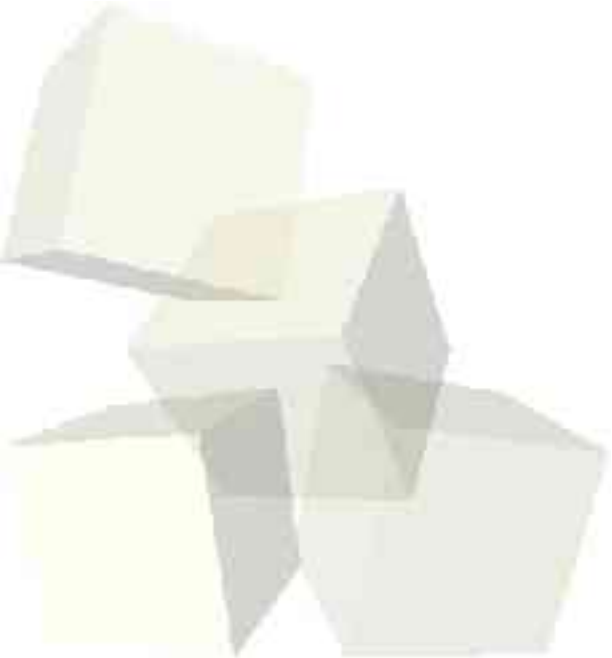
Functional Modeling

2-10-2005



Opening Discussion

- What did we talk about last class? Has anyone thought more about the computational abilities of petri-nets?



Functional Modeling

- Graph nodes are functions or variables.
- This style can be used when a model is given as distinct physical objects or when there is material flow through a system.
- Don't use them when objects in a model are tightly connected in a non-directional way.
- Often good for continuous systems.
- Let's look at the object decomposition since I have issues with what the book presents.

Function-Based Approach

- In this approach we draw blocks that represent various functions. The functions can take multiple inputs and produce multiple outputs. You can also provide different parameters to a block though the distinction between an input and a parameter can be foggy.
- Different types of functions might be simple things like basic arithmetic operations, integrations of values over time, or constants.

Block-Models and Time Slicing

- Remember how time slicing was a way for us to simulate continuous time systems by slicing time into small pieces and taking a step for each slice.
- If we have a functional block model where the output feeds back in as the input then taking one step through all the blocks is like doing a single slice of time.
- Let's look at a block diagram for a simple differential equation to see how this works.

Order of Execution

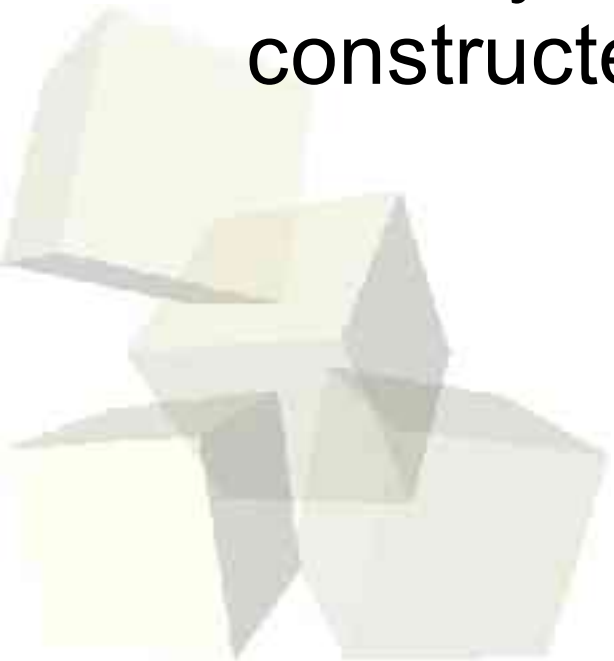
- One hitch to simulating a functional block model is the order that the blocks are processed in. You can't just pick randomly.
- The book says to drop the integration nodes and do things in order from source to sink then do the integration nodes.
- A good way to find this is to do a topological sort. That will give you sources before sinks. See CLRS for that algorithm.

Complex Functions

- The blocks can also be used to represent more complex functions in our diagram. These should be labeled to give their meaning.
- These blocks could generally be subdivided into simpler block diagrams, we drawn them as a single block to help improve understanding.

Examples and Code

- Let's try to go through some examples of this.
- Why don't we also write a bit of code for one of the types of systems we have done recently to help you see how they could be constructed.



Minute Essay

- Draw a block diagram for a mass on a spring.
- Math seminar next week.