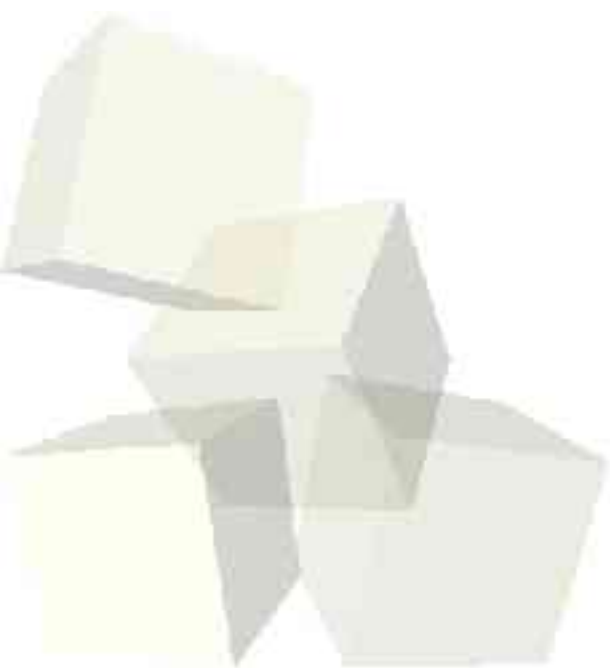# Serial Execution and Extras
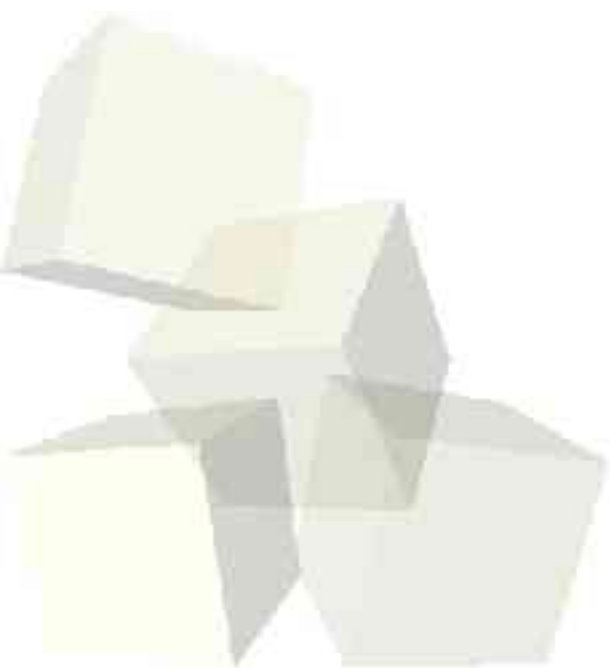
1-25-2005

Opening Discussion

- Do you have any questions about the quiz?
- What did we talk about last class?

Quick Review

- So far in this chapter we have talked about the preliminaries of simulation for data collecting and generating distributions. We have also talked about formal models of simulation and what we need to know to build as well as describe a model.
- Now we turn to the question of how we actually bring our simulation to life as a program and how we get it to execute for us. Typically we break things up either with time slicing or with event scheduling.

Time Slicing

- For many types of simulations, particularly those that should be undergoing constant change, the standard model of serial execution is time slicing.
- The idea here is that we cut time up into small pieces and activities happen in the simulation at those slices.
- The typical approach is to make the slices small enough to be accurate, but not much smaller as that involves extra work.

Event Scheduling

- A more general approach to simulation is event scheduling. With this approach the simulation advances by moving from one event to another. In a way, time slicing can be viewed as event scheduling where each slice is an event.
- There are many ways to do this, but the general idea is that when one event happens, it "looks" for other events that might need to happen in the future.

Queue Implementations

- The standard method of doing event scheduling involves a queue, generally a priority queue prioritized by time. Events go into the queue when found and come off the queue in order. Events can also be canceled.
  - Linked List – simple yet inefficient
  - Tree – works if they are balanced
  - Heap – optimal in many cases, but harder with cancel
  - Hash – each bin keeps one of the above data structures

Behavioral Modeling

- There is another type of modeling that we will not discuss significantly in this course, behavioral modeling. This type of model takes an input and gives an output that does not depend on any past history. Functions and mapping can be seen as behavioral models.
- Regression models and neural networks are also behavioral models. In both cases, we don't really "understand" how it reproduces a behavior.

Financial Applications

- Another topic that we will not cover significantly in this course, but which you should be aware of, is using simulation and modeling for cost predictions.
- How this works depends on the type of the model, but the general idea is that we can assign a cost to any state or event and accumulate costs as we run through the simulation.

Minute Essay

- What types of applications would you probably use each type of queuing data structure for? Why? In other words, what specifications would make you choose one data structure for queuing over another?