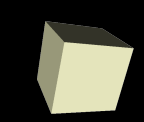
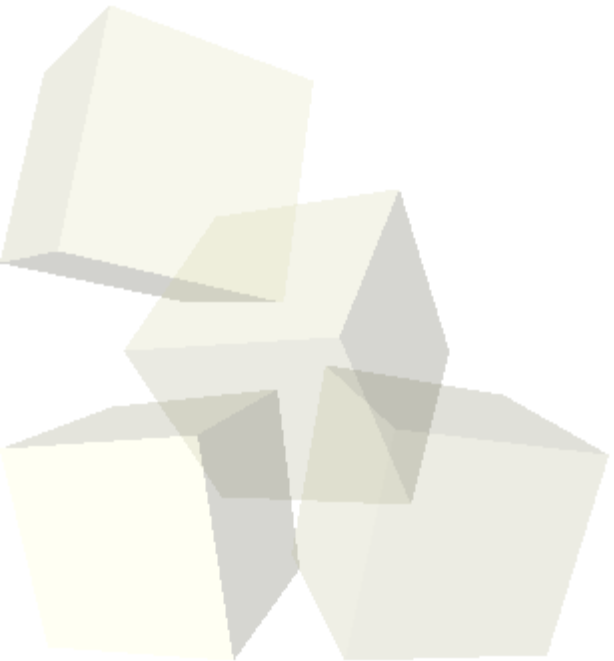


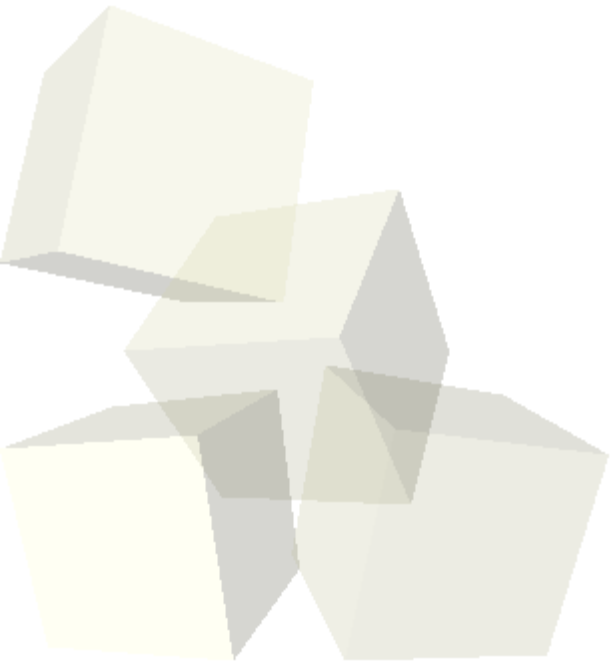
Multithreading in Java

4/14/2009

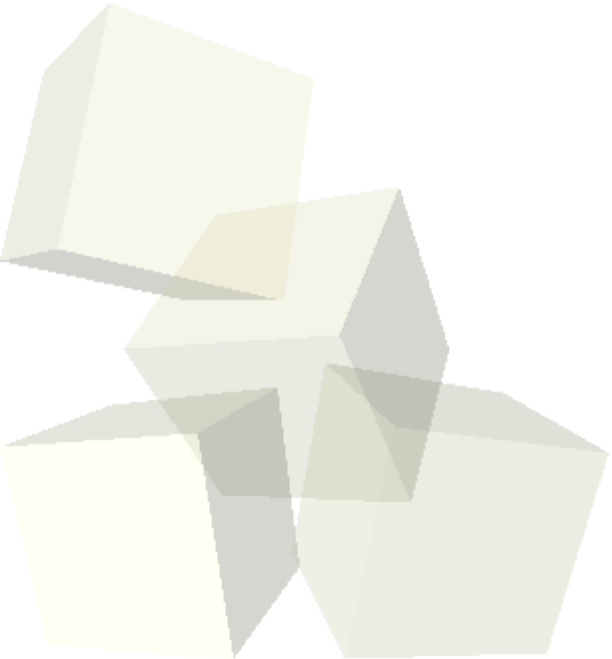


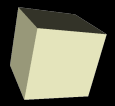
Opening Discussion

- Do you have any questions about the quiz?
- Let's look at solutions to the interclass problem.
- What could go wrong with our tree to mess up performance? It could become unbalanced and it degrades to a linked list.
- Do you have any questions about the assignment?



- Let's test our TreeMap and then add the remove method.





java.util.concurrent

- While support of threading was built into the original version of Java, some common threading tasks still aren't easy.
- There are some things that you find yourself doing rather frequently with threaded code and there are some limitations with the basic libraries that make it difficult to use at times.
- The java.util.concurrent library was added to make common parallel tasks easier. It is built around a few key concepts. Let's go look at the javadocs for this library.

Executor Interface

- The heart of the concurrent library is the Executor interface. It provides a method for running a Runnable object, but tells you nothing about how it will be run.
- The commonly used subtype of Executor is ExecutorService that supports the Callable<T> interface and Future<T> objects.
- The Executors utility class gives you a way to create some commonly used ExecutorServices.

Blocking Queues

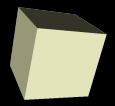
- One handy data structure in parallel applications is a blocking queue. This is a queue with a fixed number of slots in it.
- If you try to dequeue when the queue is empty, the thread will block until another thread adds something.
- If you try to enqueue when the queue is full, the thread will block until another thread removes something.

Coordinating Threads

- The concurrent library also provides a number of different classes to help with coordinating the activities of threads.
  - Semaphores – holds a number of “permits” that can be given out to threads.
  - CountDownLatch – stops threads until they have all hit the latch. Only works once.
  - Exchanger – two threads swap information at a particular point.
  - CyclicBarrier – like the CountDownLatch but works multiple times.

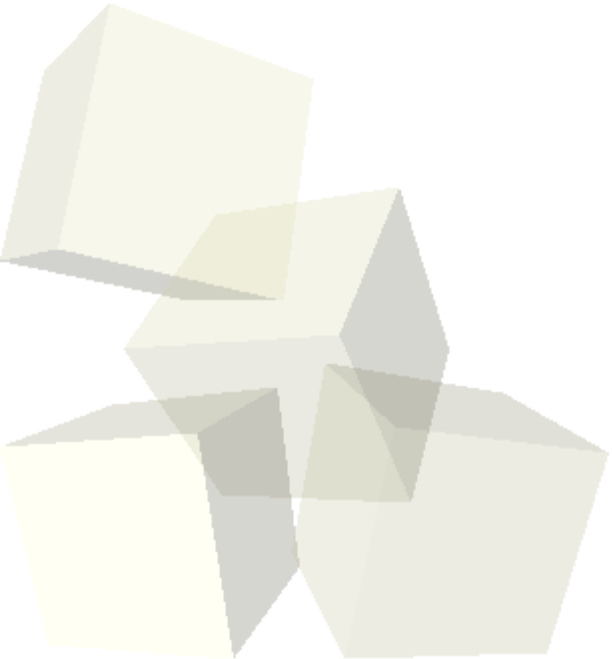
Atomic and Locks

- There are two subpackages for java.util.concurrent: atomic and locks.
- The java.util.concurrent.atomic package provides data types that have atomic access methods. These methods can't be interrupted by other threads so they can be done in a thread safe way.
- In java.util.concurrent.locks you will find classes for locks that can be used in your program. Locking is basically what the synchronized keyword does, but that can't be shared across objects or methods.



Multithreading Code

- Let's go ahead and and write something multithreaded. Instead of using the standard thread library I want us to use the facilities in java.util.concurrent.



Minute Essay

- What do you see as advantages of using java.util.concurrent? Do you have any questions about how it works?
- There are only five remaining class days.
- Interclass Problem – Make an animated Drawable, but do the animation threading with java.util.concurrent.