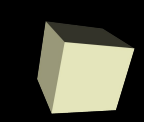
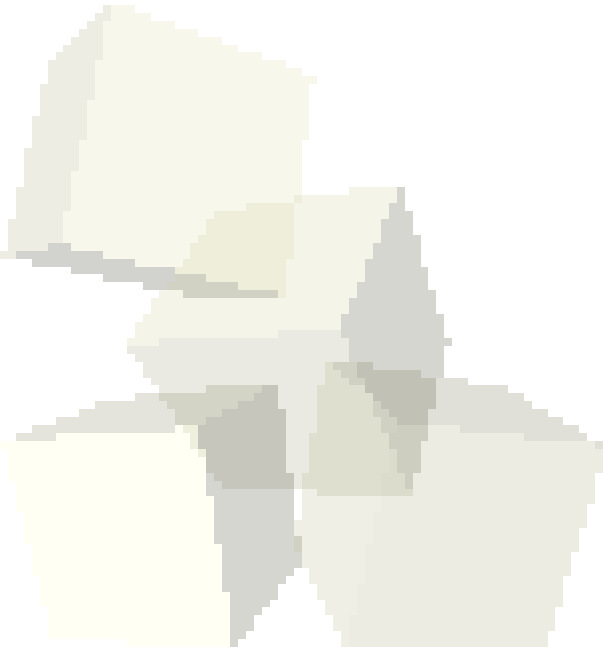


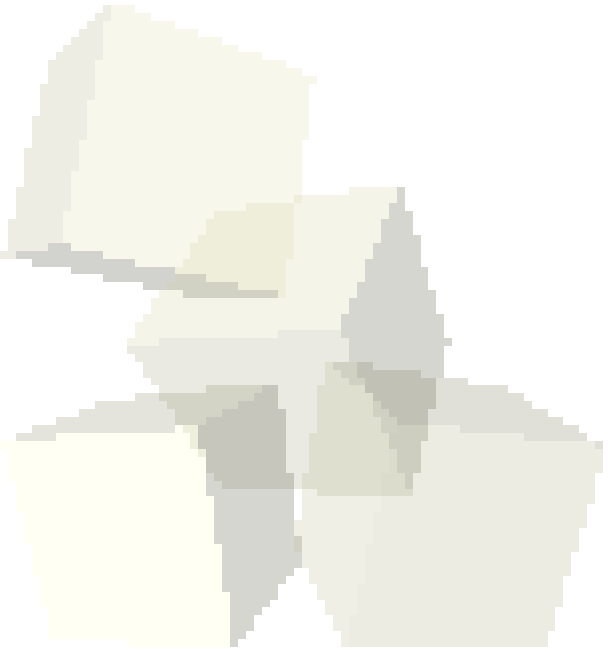
Sorting and Searching

2-11-2009



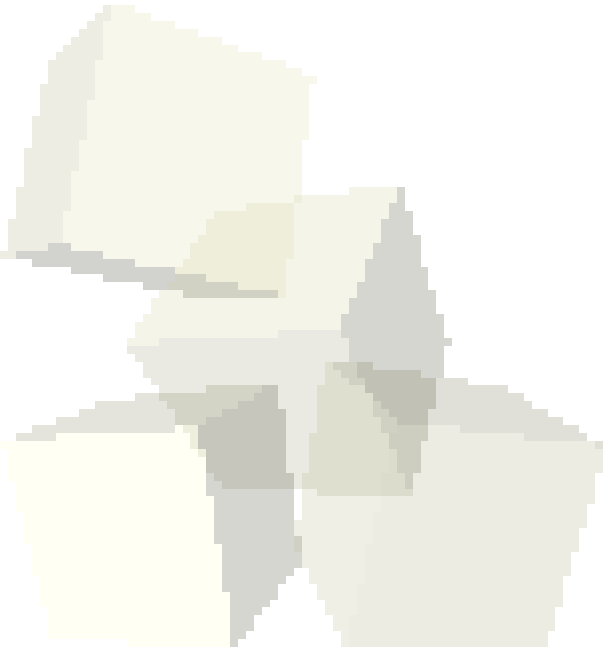
Opening Discussion

- Do you have any question about the quiz?
- Let's look at solutions to the interclass problem.
- Do you have any questions about the reading?
- Do you have any questions about the assignment?
- Minute Essay Comments
  - Getting IcP solutions.



Sorting and Searching Arrays

- These are topics that you should have talked about a fair bit in PAD1 so I'm not going to lecture on them much now.
- Instead, we'll write some code that uses arrays and these concepts.



- A function g(n) is O(f(n)) iff

$$\exists n, c : \forall m > n, c * f(m) > g(m)$$

- Let's look at what this means graphically.

Polymorphic Sorts

- One of my motivating examples for polymorphism was a sort. In C you have to write a separate sort for every type, or you have to do some very odd stuff. In Java we can write polymorphic sorts of object types in at least two ways.
- You can write a sort/search that only takes subtypes of Comparable.
- You can write a sort/search that works an any Object, but that also takes an object of type Comparator.
- I prefer the second method as it is far more flexible.
- The java.util.Arrays class contains some utility methods.

Write a Sort

- Let's write a method that uses one of the sorts you know to sort any object type. Try to make this a generic method so that it will be type safe. You can put it in a class called ArrayHelper.
- Let's make it so our comparator counts how many comparisons are made so we can see what sorts are best.
- This is something we can integrate into our command processing class. We can write a sort command that takes two arguments: sort type and number of elements.

Searching

- The most basic type of search is a brute force search where you run through a collection one item at a time. If the data is not sorted, this is all that you can do.
- If the data is sorted there are faster approaches. The most commonly used one is the binary search. It checks the middle element of a range to see if the item is above or below it. Then it does that for the half of the range that remains. In this way it continually throws out half the elements to find what you are looking for very quickly.

Minute Essay

- Do you have any questions about how we made our sort polymorphic?
- Interclass Problem – Write a polymorphic binary search. Check to make sure that it works.