List Based Stacks and Queues

3/1/2007
Opening Discussion

- Minute essay response.
- How do you implement a stack with a linked list?
- How do you implement a queue with a linked list?
I want you all to write a ListStack and a ListQueue. These should implement MyStack and MyQueue, but instead of using arrays (like ArrayStack and ArrayQueue), they should have a linked list inside of them.

Remember that it is essential that the implementation be O(1) for all operations on normal behavior.
A priority queue has the same methods as a normal queue, only the contents are ordered not only by arrival time, but also by a priority. So dequeue gets the highest priority object and if several have that priority, it gets the one that has been there the longest.

One way to implement a priority queue is with a sorted linked list. To make this flexible, you could have it take a comparator that tells you the ordering. That would be provided when the priority queue is constructed.

What order are the various operations for this implementation of a priority queue?
You can do lots of things with the standard GUI elements in Swing. We've been able to set up quite a bit of a GUI using that. However, no GUI can predict everything that you will want to do and we want to be able to add custom drawing to our application.

For this we will rely on the Java2D library. Java2D was added about the same time Swing was and it is fundamentally based on the Graphics2D class. There is also a Graphics class that provides more basic custom graphics capabilities. Graphics2D inherits from Graphics so it can do all the same things and more.
There are three steps to making a component class that we can do custom drawing to.
- Make a new class and have it inherit from JComponent or a subtype of it.
- Override the paintComponent method in your class.
- Draw with the Graphics object that was passed into the paintComponent method.

Let's look a bit at the Graphics2D class to see what some of the possibilities might be for what we can draw.

Now we can do these steps in our program to make a central panel we can draw to.
Of course, Graphics2D objects aren't limited to just drawing on components.

The Image class (and its subtype BufferedImage) will let you get Graphics objects that you can draw to and what you draw will be on the image.

We'll typically do this even if we are drawing to a component to implement buffering which reduces flicker.
What do you see as the relative advantages and disadvantages of the array and list based implementations of stacks and queues?

The midterm is next class. The office hours on Monday will be used for a review session if you show up with questions for me to answer.