So… Use Threads!

- Just fire up a separate thread for your long-running task. It can update the GUI; the event dispatch thread can take care of buttons and window resizing and …

- Demo

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Rules for Code in the Event Thread

- If an action takes a long time, fire up a new thread to do the work.
- If an action can block on input or output, fire up a new thread to do the work.
- If you need to wait for a specific amount of time, don't sleep in the event dispatch thread. Instead, use a timer.
- The work that you do in your threads cannot touch the user interface. Read any info from the UI before you launch your threads, launch them, and then update the UI from the event dispatching thread once the threads have completed.

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Swing is Not Thread Safe

- A few Swing methods are thread safe. They will be identified in the documentation with “This method is thread safe, although most Swing methods are not.”
  - JTextComponent.setText JTextArea.append
  - JComponent.repaint JComponent.revalidate
- You can safely add and remove listeners in any thread. (Be careful with your own observers.)
- You can construct components, set properties, and add them to containers as long as they have not been *realized*.

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invokeLater

```
SwingUtilities.invokeLater(new Runnable() {
            public void run() {
                // Model updates the UI...
                if (model.contains(i))
                    model.removeElement(i);
                else
                    model.addElement(i);
            }
        });
```

Handling Long Tasks: Overview

- Break task up into smaller subtasks
- Execute subtasks on Swing render thread or in separate thread
- Optionally provide means to query how complete task is (i.e., how “finished” it is)
- Clean up any resources
  - Close files, delete temporary files, etc.

24-June-09 Announcements

- Hand back A2
- Due date to A3 changed
- No class on Wednesday, July 1
- Midterm on Friday, July 3
  - In “class”: 1:00-2:20, MC2017
  - Content up to and including June 29
  - Emphasize mostly material since first midterm 1, but some overlap with material at the boundary
  - Style similar to MT1 (eg: lots of short answer, some coding)

Breaking Task Up

Two ways of breaking task up:

1. Create one long method that regularly checks to see if it should be stopped
   - Only really applicable for executing task in a separate thread
2. Create method that maintains current “progress”
   - Can be designed to be used in render thread or separate thread

Common Functionality

- Regardless of specific approach, should provide methods to execute task, cancel task, check whether task was completed successfully:
  - run()
  - cancel()
  - isDone()
  - wasCancelled()
  - progress()

Task in One Long Method

- Task runs in a separate thread
  - Typically implemented via Runnable object
- Method regularly checks if task should be cancelled
- Demo…