Lecture 4: Standard Java
Events & List

CS 62
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Lab & Assignment 1

- Strip with 12 squares & 5 silver dollars placed randomly on the board.
- Move silver dollars to fill 5 leftmost squares
  - Coins move only to the left.
  - No coin may pass another.
  - No square may hold more than one coin.
- Last person to move wins.
- Complete description in text.

ArrayList Specification

- Class ArrayList<E> implements List<E>
- Important methods:
  - add, get, set, indexOf, isEmpty, remove, size, contains, clear
  - size, isEmpty, get, set take constant time
  - add (to end) is "amortized constant" time
- See javadoc at
  - http://docs.oracle.com/javase/8/docs/api/
  See PostIt example later!

Read Lab & Assignment Before Lab Today!

Rest of today's lecture is info for lab and assignment!
Last Time: Java Graphics

For details, see document on course web page associated with lecture
Also see GUI cheat sheet in documentation and handouts section.

Overview

- Graphical User Interfaces (GUI)
  - JFrame (window), JPanel (grouping)  Done!!
  - JButton, JTextField, JSlider, JComboBox, ...
- Events:
  - Generated by mouse actions, button clicks, etc
  - Use MouseListener, MouseMotionListener, ActionListener, etc. to respond
- Graphics
  - Drawing items on the screen - Done

General graphic applications

- Create an extension of component (either JPanel, JFrame, or JApplet) and implement paint method in the subclass.
  - See main method of demo to get window to show
  - At start of paint method cast g to Graphics2D to get access to new methods
- Call repaint() on component every time make a change.
  - Causes OS to schedule call of paint in event queue
  - Called automatically if window obscured and revealed

PostItStdApplication

- More sophisticated
  - JFrame contains two JPanels
  - JFrame uses BorderLayout, so add controls to JPanel in SOUTH, drawing canvas in CENTER of the JFrame
    - Ignore controls for now
    - See GUI cheat sheet for details
  - DrawingCanvas extends JPanel -- contents paint method
  - Note use of ArrayList to hold PostIts.
PostIt class

- Represents the rectangles being dragged:
  - Contains accessor and mutator methods to allow it to be manipulated by drawing program.
  - Could add features (title bar, go-away box) without affecting PostItApplication code.

PostItApplication

- PostItApplication class responsible for
  - setting up the GUI
  - Responding to button pressed and menu selections
  - Sets up ArrayList of items on canvas.
- Class has 3 inner classes
  - DrawingCanvas
  - DrawingMouseListener
  - DrawingMouseMotionListener
  - Inner classes have access to private features of containing class

Inner classes

- DrawingCanvas extends JPanel
  - Associates listeners for mouse actions on the panel
  - Responsible for repainting the screen
- DrawingMouseListener and DrawingMouseMotionListener
  - Responsible for responding to mouse actions by changing the items in the ArrayList.

Event-Driven Programming
Handling Mouse Events

- If want program to react to mouse press, click, or release on a component
  - send addMouseListener(mlo) to component (usually in the constructor of the component)
  - See PostItApplication.java
  - For motion or drag, send addMouseMotionListener(mlo)

- When user presses mouse on a component
  - Computer looks for registered “MouseListener” for component or its containers.
  - If found, sends mousePressed(evt) to listener

Listener

- object designated as mouse listener must
  - implement MouseListener (& implement mousePressed, mouseReleased, & mouseClicked) or
  - extend MouseAdapter (which has default implementations of all 3)

- Second is easier unless class already extends another.  *Can only extend one class in Java*

- Similarly, for mouse motion listener
  - implement MouseMotionListener or
  - extend MouseMotionAdapter

GUI Objects & Events

- Similar to handling mouse events, but must also install components in a container.
- See GUI cheat sheet in Documentation & Handouts.

Listeners in PostItApplication

- Main class (this) is listener for buttons and choice.  Set up when GUI items constructed
- Special listener objects for mouse actions.  Set up by DrawingCanvas since listening for actions on that object.
List Operations

• Review list operations from library interface List<E> in Java 8 documentation.
  • Bailey's List<E> is slightly different.
• Think about how implement with array.