Lecture 5: Events & Assertions

CS 62
Fall 2017
Kim Bruce & Alexandra Papoutsaki

Assignment 1

- Due date postponed to Monday

- However, no TA's on duty Monday night

- I'll have office hours most of Monday afternoon.

- Try to get it done by Sunday.

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 Demo.java & then 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.
- See also "Handling Mouse Events in Java"

Listeners in PostItApplication

- Main class (this) is listener for button 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.

Pre and Post-conditions

- Pre-condition: Specification of what must be true for method to work properly
- Post-condition: Specification of what must be true at end of method if precondition held before execution.
- See Ratio class example

Assertions in Java

- Won't use Assert class from Bailey.

- Command to check assertions in standard Java
  - Two forms
    - assert boolExp
    - assert boolExp: message

- Article on when to use assert:
  - http://docs.oracle.com/javase/8/docs/technotes/guides/language/assert.html
  - Short summary -- never use for preconditions of public methods -- make explicit checks
  - Use for postconditions & class invariants

Assertions help ...

- Defensive programming
  - Little cost to executing assertions ... and can turn off checking
  - Extremely useful in debugging in tracking down what is going wrong - can be better than inserting println's.
  - Also useful in checking cases that should not occur
    - e.g., defaults in switch, other control paths not taken.

Turning on assert

- Turn on assertions when run program, by adding "-ea" (without quotes) as virtual machine argument in arguments tab in Eclipse when set up runtime configuration.

- If leave it off, then ignores assert statements.

- If on and the assertion is false, then will raise an AssertionError exception and will print associated message
  - They should not be caught as represents a program error

Using Assert & Pre/postconditions

- Preconditions of public methods must be enforced.
  - But don't use assert! *Why not?*

- Preconditions of private methods should also be enforced
  - Can use assert to check preconditions of private method
  - Why?

- Use assert to check postconditions and other class invariants

Arrays & ArrayList

Arrays

- Containers that hold objects
  - C[ ] myArray = new C[10]   *// fixed length*
  - Different syntax from objects
  - Public instance variable "length" — *Ugh!*

- Because of limitations of Java virtual machine, cannot create array of type variable:
  - E.g., new T[5] illegal if T is type variable
  - new C[5] is legal if C is primitive, class, or interface name.

ArrayList

- What happens if need more space in array than originally allocated?

- ArrayList is class that creates objects that dynamically expand as needed.

- Part of java.util package

- To get access write import java.util.ArrayList or import java.util.*

- Lab: Squares rep by ArrayList of CoinSquares.

  Text uses Vector rather than ArrayList
  ArrayList more efficient if no concurrency

Back to PostIt

Look at use of ArrayList