GUI Elements in Java

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GUI Elements

- **Component**: items displayed (widgets)
- **Container**: region containing widgets
- **Layout**: arrangement of container
- **Event**: interactions for GUI
GUI Elements – Component

- **Definition**
  - Actual items (widgets) user sees in GUI

- **Examples**
  - Labels (fixed text)
  - Text areas (for entering text)
  - Buttons
  - Checkboxes
  - Tables
  - Menus
  - Toolbars
  - Etc…

GUI Elements – Container

- **Definition**
  - Abstractions occupying space in GUI

- **Properties**
  - Usually contain one or more widgets
  - Can be nested in other containers

- **Example**
  - Window containing
    - 1 menu (component)
    - 3 buttons (component)
    - 2 windows (container)
GUI Elements – Layout

Definition
- Arrangement of widgets in container

Layout specification
- Logical terms (2nd row, 1st column, left)
  - Preferred approach
- Actual coordinates (100 pixels, 5 inches)
  - Can be too rigid, limited to certain window sizes

Layout manager
- Entity translating layout specifications into actual coordinates at runtime, depending on conditions

Example Java Layout Managers

- GridLayout
  - Lays out components in a grid of user specified size

- BorderLayout
  - Designates portions of the container as North, South, East, West, and Center

- CardLayout
  - Adds components one on top of another

- GridBagLayout
  - Customizable manager that can use rows and columns of varying lengths
GUI Elements – Events

- Definition
  - Action or condition occurring outside normal flow of control of program

- Examples
  - Mouse clicks
  - Keyboard input
  - Menu selections
  - Window actions

Java GUI Classes

- AWT (Abstract Window Toolkit) (java.awt.*)
  - Old GUI framework for Java (Java 1.1)
  - Some reliance on native code counterparts
  - Platform independence problems

- Swing (javax.swing.*)
  - New GUI framework first introduced in Java 1.2
  - Includes AWT features plus many enhancements
  - Pure Java components (no reliance on native code)
  - Pluggable look and feel architecture
JFrame Hierarchy

- Several super classes and well as implemented interfaces
- Many, many member methods including inherited methods that allow for operations such as resizing, setting properties, adding components, etc.
- Other top level containers
  - JDialog (dialog boxes)
  - JApplet (web applets)
  - JWindow (stripped down JFrame, no title bar or window buttons)

Java GUI Components

- Examples
  - JFrame
  - JTextField
  - JLabel
  - JButton
  - JList
  - JComboBox
  - Menu
  - Combo
  - Panes
  - Indicators
  - Dialog boxes
  - JFileChooser
  - Color chooser
  - JTable
  - JTree
Examples

- Illustrates how to create a JFrame and a JPanel
- Illustrates how we can set a call back to take care of certain mouse events (those associated with MouseListener)
- Example: package example1 of code distribution.
- Example: package example2 – Shows how we can put all together in one class
- Example: package example3 – Shows how two layout managers organize components

JFrame Structure

- Most things go into content pane
  - getContentPane()
- Use glassPane for pop up menus, some animations
- Methods
  - getRootPane()
  - getLayeredPane()
  - getContentPane()
  - getGlassPane()
- Can set…Pane explicitly

LayeredPane manages (optional) JMenuBar
LayeredPane contains contentPane
JFrame

JTextField and JLabel
Buttons

JList and JComboBox
Menu

Panels and Panes

Tabbed Pane

Split Pane

Scroll Pane
Various Indicators

Spinner

Slider

Progress Bar

A Dialog Box

An Inane Question

Would you like green eggs and ham?

Yes  No
JFileChooser

Color Chooser
Jtable and JTree

<table>
<thead>
<tr>
<th>First Name</th>
<th>Last Name</th>
<th>Favorite Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jeff</td>
<td>Dinkins</td>
<td></td>
</tr>
<tr>
<td>Ewan</td>
<td>Dinkins</td>
<td></td>
</tr>
<tr>
<td>Amy</td>
<td>Fowler</td>
<td></td>
</tr>
<tr>
<td>Hania</td>
<td>Gajewska</td>
<td></td>
</tr>
<tr>
<td>David</td>
<td>Geary</td>
<td></td>
</tr>
</tbody>
</table>

Text Fields

This is an editable JTextPane that has been initialized with the searchText method. A text area is a "plain" text component, which means that although it can display text in any font, all of the text is in the same font.

This is an editable JTextPane, another styled text component, which supports embedded components... and embedded icons...