Graphical User Interfaces

CSC 2014 – Java Bootcamp

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Some slides in this presentation are adapted from the slides accompanying Java Software Solutions by Lewis & Loftus
Graphical User Interface (GUI)

• A GUI component
  – an object that represents a screen element
  – examples: buttons, text fields, labels, panels, frames

• GUI-related classes from packages:
  – java.awt  Abstract Windowing Toolkit (AWT): the original Java GUI package
  – javax.swing  Swing provides additional and more versatile components
GUI Containers - Frames

frame: a container displayed as a separate window
• can be repositioned and resized on the screen as needed
• has its own title bar with close-minimize-resize buttons

a heavyweight container:
• managed by the underlying operating system
GUI Containers - Panels

**panel** – a container used to organize other components

- must be added to another container (e.g., frame or other panel) to be displayed

**a lightweight container:**
- managed by the Java program itself

```java
// Authority.java  Author: Lewis/Loftus
// Demonstrates the use of frames, panels, and labels.
import java.awt.*;
import javax.swing.*;
public class Authority {
    //-----------------------------------------------------------------
    // Displays some words of wisdom.
    //-----------------------------------------------------------------
    public static void main (String[] args) {
        JFrame frame = new JFrame ("Authority");
        frame.setDefaultCloseOperation (JFrame.EXIT_ON_CLOSE);
        JPanel primary = new JPanel();
        primary.setBackground (Color.yellow);
        primary.setPreferredSize (new Dimension(250, 75));
        JLabel label1 = new JLabel ("Question authority, ");
        JLabel label2 = new JLabel ("but raise your hand first.");
        primary.add (label1);
        primary.add (label2);
        frame.getContentPane().add(primary);
        frame.pack();
        frame.setVisible(true);
    }
}
```
GUI Containers - Panels

**panel** – a container used to organize other components

- must be added to another container (e.g., frame or other panel) to be displayed

a **lightweight** container:
- managed by the Java program itself

```java
// Authority.java  Author: Lewis/Loftus
// Demonstrates the use of frames, panels, and labels.
public class Authority {
    DEFINE_DEFAULT_CLOSE_OPERATION
    define JFrame;
   (JFrame.EXIT_ON_CLOSE);
    // Displays some words of wisdom.
    public static void main (String[] args) {
        primary.setBackground (Color.yellow);
        primary.setPreferredSize (new Dimension(250, 75));
        primary.add (label1);
        primary.add (label2);
        frame.getContentPane().add(primary);
        frame.pack();
        frame.setVisible(true);
    }
}
```
Other components: Labels

**Label** – a GUI component that displays a line of text and/or an image

- See **Authority.java**

```java
import java.awt.*;
import javax.swing.*;

public class Authority{
   //-----------------------------------------------------------------
   // Displays some words of wisdom.
   //-----------------------------------------------------------------
   public static void main(String[] args){
      JFrame frame = new JFrame("Authority");
      frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
      JPanel primary = new JPanel();
      primary.setBackground(Color.yellow);
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      JLabel label1 = new JLabel("Question authority,");
      JLabel label2 = new JLabel("but raise your hand first.");
      primary.add(label1);
      primary.add(label2);
      frame.getContentPane().add(primary);
      frame.pack();
      frame.setVisible(true);
   }
}
```
import java.awt.*;
import javax.swing.*;

public class Authority
{
    public static void main (String[] args)
    {
        JFrame frame = new JFrame ("Authority");

        frame.setDefaultCloseOperation (JFrame.EXIT_ON_CLOSE);

        JPanel primary = new JPanel();
        primary.setBackground (Color.yellow);
        primary.setPreferredSize (new Dimension(250, 75));
        JLabel label1 = new JLabel ("Question authority,");
        JLabel label2 = new JLabel ("but raise your hand first.");

        primary.add (label1);
        primary.add (label2);

        frame.getContentPane().add(primary);
        frame.pack();
        frame.setVisible(true);
    }
}
Example: Nested panels [NestedPanels.java](#)

```java
//********************************************************************
// NestedPanels.java    Author: Lewis/Loftus

// Demonstrates a basic component hierarchy.
//********************************************************************
import java.awt.*;
import javax.swing.*;

public class NestedPanels {
  //-----------------------------------------------------------------
  // Presents two colored panels nested within a third.
  //-----------------------------------------------------------------
  public static void main (String[] args) {
    JFrame frame = new JFrame ("Nested Panels");
    frame.setDefaultCloseOperation (JFrame.EXIT_ON_CLOSE);
    
    // Set up first subpanel
    JPanel subPanel1 = new JPanel();
    subPanel1.setPreferredSize (new Dimension(150, 100));
    subPanel1.setBackground (Color.green);
    JLabel label1 = new JLabel ("One");
    subPanel1.add (label1);
    
    // continued
```
// Set up second subpanel
JPanel subPanel2 = new JPanel();
subPanel2.setPreferredSize (new Dimension(150, 100));
subPanel2.setBackground (Color.red);
JLabel label2 = new JLabel ("Two");
subPanel2.add (label2);

// Set up primary panel
JPanel primary = new JPanel();
primary.setBackground (Color.blue);
primary.add (subPanel1);
primary.add (subPanel2);

frame.getContentPane().add(primary);
frame.pack();
frame.setVisible(true);
import java.awt.*;
import javax.swing.*;

public class LabelDemo
{
  public static void main (String[] args)
  {
    JFrame frame = new JFrame ("Label Demo");
    frame.setDefaultCloseOperation (JFrame.EXIT_ON_CLOSE);

    ImageIcon icon = new ImageIcon ("devil.gif");

    JLabel label1, label2, label3;

    label1 = new JLabel ("Devil Left", icon, SwingConstants.CENTER);

    continued
continued

    label2 = new JLabel("Devil Right", icon, SwingConstants.CENTER);
    label2.setHorizontalTextPosition(SwingConstants.LEFT);
    label2.setVerticalTextPosition(SwingConstants.BOTTOM);

    label3 = new JLabel("Devil Above", icon, SwingConstants.CENTER);
    label3.setHorizontalTextPosition(SwingConstants.CENTER);
    label3.setVerticalTextPosition(SwingConstants.BOTTOM);

    JPanel panel = new JPanel();
    panel.setBackground(Color.cyan);
    panel.setPreferredSize(new Dimension(200, 250));
    panel.add(label1);
    panel.add(label2);
    panel.add(label3);

    frame.getContentPane().add(panel);
    frame.pack();
    frame.setVisible(true);
}
Custom JPanel

• The next example shows how to draw your own Graphics on a panel

Example: SmilingFacePanel
SmilingFacePanel.java  (custom JPanel with smiling face)

SmilingFace.java  (program that uses SmilingFacePanel – driver class)
import javax.swing.JFrame;

public class SmilingFace
{
    // Creates the main frame of the program.
    public static void main (String[] args)
    {
        JFrame frame = new JFrame("Smiling Face");
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        SmilingFacePanel panel = new SmilingFacePanel();
        frame.getContentPane().add(panel);
        frame.pack();
        frame.setVisible(true);
    }
}
public class SmilingFacePanel extends JPanel {

    private final int BASEX = 120, BASEY = 60; // base point for head

    public SmilingFacePanel () {
        setBackground (Color.blue);
        setPreferredSize (new Dimension(320, 200));
        setFont (new Font("Arial", Font.BOLD, 16));
    }

    continue
// Draws a face.
public void paintComponent (Graphics page) {
    super.paintComponent (page);
    page.setColor (Color.yellow);
    page.fillOval (BASEX, BASEY, 80, 80); // head
    page.fillOval (BASEX-5, BASEY+20, 90, 40); // ears

    page.setColor (Color.black);
    page.drawOval (BASEX+20, BASEY+30, 15, 7); // eyes
    page.drawOval (BASEX+45, BASEY+30, 15, 7);

    page.fillOval (BASEX+25, BASEY+31, 5, 5); // pupils
    page.fillOval (BASEX+50, BASEY+31, 5, 5);

    page.drawArc (BASEX+20, BASEY+25, 15, 7, 0, 180); // eyebrows
    page.drawArc (BASEX+45, BASEY+25, 15, 7, 0, 180);

    page.drawArc (BASEX+35, BASEY+40, 15, 10, 180, 180); // nose
    page.drawArc (BASEX+20, BASEY+50, 40, 15, 180, 180); // mouth
    page.setColor (Color.white);
    page.drawString ("Always remember that you are unique!",
                    BASEX-105, BASEY-15);
    page.drawString ("Just like everyone else.", BASEX-45, BASEY+105);
}