Graphical User Interfaces

Graphical User Interfaces

CSC 1051 – Data Structures and Algorithms I

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Course website:
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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

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

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GUI Containers - Panels

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a lightweight container:
• managed by the Java program itself

Example: Authority.java

```java
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);
    }
}
```

Other components: Labels

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

• See Authority.java

Example: Nested panels NestedPanels.java

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

public class NestedPanels {
    public static void main (String[] args) {
        JFrame frame = new JFrame("Nested Panels");
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        JPanel subPanel1 = new JPanel();
        subPanel1.setBackground(Color.green);
        JLabel label1 = new JLabel("One");
        subPanel1.add(label1);
        JPanel subPanel2 = new JPanel();
        subPanel2.setBackground(Color.red);
        JLabel label2 = new JLabel("Two");
        subPanel2.add(label2);
        subPanel1.add(subPanel2);
        frame.getContentPane().add(subPanel1);
        frame.pack();
        frame.setVisible(true);
    }
}
```
Graphical User Interfaces

Example: `LabelDemo.java`

```java
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);
        label2 = new JLabel("Devil Right", icon, SwingConstants.CENTER);
        label3 = new JLabel("Devil Above", icon, SwingConstants.CENTER);
        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`

```java
SmilingFacePanel.java (custom JPanel with smiling face)
SmilingFace.java (program that uses SmilingFacePanel – driver class)
```

Custom JPanel

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

Example: `SmilingFacePanel`

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Custom JPanel

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

Example: `SmilingFacePanel`

```java
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);
    }
}

import javax.swing.JPanel;
import java.awt.*;
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));
    }

    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.drawArc(BASEX+20, BASEY+25, 15, 7, 0, 180); // eyebrows
        page.drawArc(BASEX+45, BASEY+25, 15, 7, 0, 180);
        page.drawArc(BASEX+25, BASEY+40, 15, 10, 180, 180); // nose
        page.drawString("Always remember that you are unique!", BASEX-105, BASEY-15);
        page.drawString("Just like everyone else.", BASEX-45, BASEY+105);
    }
}