Introduction to Java Applet Programs

Section 1.3 Intro. to Java Applet Programs: a Greeter Applet

Section 3.7 Graphical/Internet Java: Applet: An Einstein Calculator

Sections 4.5 & 5.4 Graphical/Internet Java: Old MacDonald ... Applet

Swing Containers

http://www.cs.huji.ac.il/support/docs/java/jdk1.3/demo/jfc/SwingSet2/SwingSet2Plugin.html

Top-Level: **`JApplet`**, **`JFrame`**

- They create an area of the screen called a window or frame where the graphical output is to take place.

```
import javax.swing.*;

class FrameExample {

  public static void main(String [] args) {

    JFrame frame = new JFrame("A JFrame");
    frame.show();
  }
}
```

SwingSet

Panes:

- Each of these frames contains layers of containers called panes (or panels). The most important of these is the content pane.
- The content pane is what is used to group and position the widgets that actually do the painting (i.e., drawing) on the screen, or perform some other action.

- The content pane can be accessed via the getContentPane() method. For example:

```
frame.getContentPane().add(JButton("Press");
```

`JButton` creates a button.

- Constructors can create an unlabeled button, one with text on it, or an icon on it,or both.
- **`addActionListener()`** is used to add a *listener* to the button that listens for events (e.g., button press)

Action Listeners:

- They are used for certain widgets that respond to events _ e.g., buttons.
- **`java.awt.event.ActionListener`** is an interface that demands only one method be implemented:

```
public void
    actionPerformed(ActionEvent event);
```

- The event passed to this method can be safely ignored.
- For a button, this method will be called when the button is pressed.

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Layouts:

- How the components are organized on the content pane _ size and how they are arranged _ is determined by the container's layout manager.
- Containers inherit a **`setLayout()`** method from the **`Container`** class for setting the layout. But several of them have a default layout.
- AWT provides several standard ones; each of them is a class in the **`java.awt`** package.

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Flow Layout:

- The simplest AWT layout manager. It's the default layout manager for **`JPanel`**.
- **`FlowLayout`** lays out components side-by-side starting near the top of the content pane, working downward as each row is filled.
- Constructor: Just the default one is common: **`FlowLayout()`**

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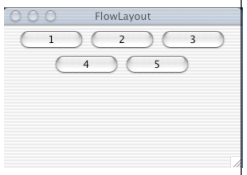
```
import javax.swing.*;
import java.awt.*;

public class FlowLayoutExample {
  public static void main(String[] args) {
    JFrame f = new JFrame("FlowLayout");

    f.getContentPane().setLayout(new FlowLayout());
    for (int i = 1; i <= 5; i++) {
      JButton b = new JButton("" + i);
      f.getContentPane().add(b);
    }
    f.setVisible(true);
  }
}
```



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Grid Layout:

- **`GridLayout`** lays out components in a grid.
- Constructor:
  `GridLayout(int rows, int cols)`
  - Parameters are the number of rows and columns in the grid.
  - Either (but not both) may be 0 to represent "infinity."
  - Components are added to the content pane row-by-row in the specified grid pattern.

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

public class GridLayoutExample {
  public static void main(String[] args) {
    JFrame f = new JFrame("GridLayout");

    f.getContentPane().setLayout(new GridLayout(2, 3));
    for (int i = 1; i <= 6; i++) {
      JButton b = new JButton("" + i);
      f.getContentPane().add(b);
    }
    f.setVisible(true);
  }
}
```

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Border Layout:

- It's the *default layout for* **`JApplet`** and **`JFrame`**.
- **`BorderLayout`** divides the content pane into sections:
  - north, south, east, west, center
  - Center is the largest; extra space goes here
  - Some sections may be ignored.
- Constructor: Default: **`BorderLayout()`**
- Add a component to the a specific region of the content pane by adding a second argument:

  `BorderLayout.NORTH`, **`BorderLayout.SOUTH`**, **`BorderLayout.WEST`**, **`BorderLayout.EAST`**, **`BorderLayout.CENTER`**

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

public class BorderLayoutExample {
  public static void main(String[] args) {
    Keyboard k = new Keyboard();

    JFrame f = new JFrame("BorderLayout");
    f.getContentPane().setLayout(new BorderLayout());

    JButton b = new JButton("NORTH");
    f.getContentPane().add(b, BorderLayout.NORTH);
    f.show();
    k.getChar();

    b = new JButton("SOUTH");
    f.getContentPane().add(b, BorderLayout.SOUTH);
    f.show();
    k.getChar();
  }
```

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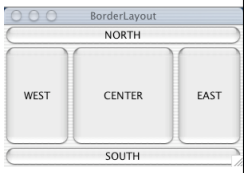
```
    b = new JButton("CENTER");
    f.getContentPane().add(b, BorderLayout.CENTER);
    f.show();
    k.getChar();

    b = new JButton("WEST");
    f.getContentPane().add(b, BorderLayout.WEST);
    f.show();
    k.getChar();

    b = new JButton("EAST");
    f.getContentPane().add(b, BorderLayout.EAST);
    f.show();
  }
}
```



Applets vs. Applications

- Applications are stand-alone programs
  - executed with Java interpreter
- An applet is a small program that:
  - can be placed on a web page
  - can be executed by a web browser or with Java's appletviewer
  - gives web pages "dynamic content"

See Greeter2.java and Greeter2.html in §1.3


```
import javax.swing.*;   // JApplet, JLabel
import java.util.*;     // Date
public class Greeter extends JApplet  {

  public void init() {

    Date currentDate = new Date();
    String today = currentDate.toString();

    JLabel greeting = new JLabel(
            "Today, " + today +
            ", we begin our study of applets!" );
    getContentPane().add(greeting);
  }
}
```


Notes about Applets:

- Syntax

  `public class ClassName extends JAapplet`
  - Extends **`JApplet`** (or **`Applet`**)
  - Must be public
- Body
  - There is no **`main()`** method in an applet
  - **`JApplet`** class provides other methods instead
  - First method executed is the **`init()`** method that is not declared **`static`**

- Statements
  - Declaration statements for `Date` are no different than in applications.
  - Label declaration

    ```
    JLabel greeting = new JLabel ( … )
    ```

    for freestanding strings of text (not part of a button or menu)
  - Content pane: portion of window where label is added:

    ```
    getContentPane().add(greeting)
    ```


Example: Building a Temperature-Conversion Applet

(similar to Einstein Applet in §3.7)

Problem Scenario:

Write a program to read a temperature in Celsius, compute and display the equivalent Fahrenheit temperature. However, instead of the text-based solution or GUI-application from before, use an *applet*.


```
/* TemperatureApplet.java converts Celsius
 *      temperatures to Fahrenheit.
 * Author: L. Nyhoff
 * Date:   Nov. 29, 2002
 */

import java.awt.*;       // BorderLayout
import javax.swing.*;    // JApplet, JTextArea, JOptionPane

public class TemperatureApplet extends JApplet {

  JTextArea introArea,
            inputArea,
            outputArea;

  public void init() {

    introArea = new JTextArea("Celsius-to-Fahrenheit Converter");
    inputArea = new JTextArea("\n\n\nCelsius\nTemperature:\n");
    outputArea = new
                 JTextArea("\n\n\nFahrenheit\nTemperature:\n");

    getContentPane().add(introArea, BorderLayout.NORTH);
    getContentPane().add(inputArea, BorderLayout.CENTER);
    getContentPane().add(outputArea, BorderLayout.EAST);
```



```
    String TITLE = "Celsius-to-Fahrenheit Conversion";
    String celsiusString = JOptionPane.showInputDialog(
                           null,
                           "Please enter the temperature in Celsius: ",
                           TITLE,
                           OptionPane.QUESTION_MESSAGE);

    inputArea.append(celsiusString);

    double celsius = Double.parseDouble(celsiusString);
    double fahrenheit = ((9.0/5.0)*celsius) + 32;

    outputArea.append(Double.toString(fahrenheit));

  }
}
```

Applet can be loaded as part of a web page and executed using Java's appletviewer (or by a browser):

```
<!-- TemperatureApplet.html -->

<title>TemperatureApplet</title>
<hr>
<applet CODEBASE="" CODE="TemperatureApplet.class"
 WIDTH = 300 HEIGHT = 200>
</applet>
<hr>
<a href="TemperatureApplet.java">The source.</a>
```

To run the applet:

```
appletviewer TemperatureApplet.html
```


"Just Messing Around . . ."

```
/* TemperatureApplet1.java converts Celsius
 *      temperatures to Fahrenheit.
 * Author: L. Nyhoff
 * Date:   Nov. 29, 2002
 */
import java.awt.*;      // BorderLayout
import javax.swing.*;   // JApplet, JLabel, JTextArea, JOptionPane

public class TemperatureApplet1 extends JApplet
{
    JLabel thermLabel,
           coldLabel,
           hotLabel,
           comfortLabel;
    JTextArea introArea,
              inputArea,
              outputArea;

  public void init()   {

    thermLabel = new JLabel(new ImageIcon("thermometer.jpg"));
    hotLabel = new JLabel(new ImageIcon("tempHot.gif"));
    coldLabel = new JLabel(new ImageIcon("tempCold.gif"));
    comfortLabel = new JLabel(new ImageIcon("tempNice.gif"));
```



```
    introArea = new JTextArea("Celsius-to-Fahrenheit Converter");
    Font boldFont = new Font("Arial", Font.BOLD, 16);
    introArea.setFont(boldFont);
    inputArea = new JTextArea("\n\nCelsius\nTemperature:\n");
    outputArea = new JTextArea("\n\nFahrenheit\nTemperature:\n");

    getContentPane().add(introArea, BorderLayout.NORTH);
    getContentPane().add(thermLabel, BorderLayout.WEST);
    getContentPane().add(inputArea, BorderLayout.CENTER);
    getContentPane().add(outputArea, BorderLayout.EAST);

    String TITLE = "Celsius-to-Fahrenheit Conversion";
    String celsiusString = JOptionPane.showInputDialog(
                           null,
                           "Please enter the temperature in Celsius: ",
                           TITLE,
                           OptionPane.QUESTION_MESSAGE);
    inputArea.append(celsiusString);

    double celsius = Double.parseDouble(celsiusString);
    double fahrenheit = ((9.0/5.0)*celsius) + 32;

    outputArea.append(Double.toString(fahrenheit));

    if (fahrenheit <= 32)
      getContentPane().add(coldLabel, BorderLayout.SOUTH);
    else if (fahrenheit >= 90)
      getContentPane().add(hotLabel, BorderLayout.SOUTH);
    else
      getContentPane().add(comfortLabel, BorderLayout.SOUTH);
  }
}
```


Graphics on GUIs & Applets

(§ 6.5)

We must, of course, first create a frame (window) on which to paint (draw):

- **`JApplet`** for applets
- **`CloseableFrame`** (an extension of **`JFrame`**) from the **`ann.gui`** package is convenient for GUI apps, because it handles window-closing events

The recommended practice is to design a "canvas" on which to paint that is a subclass of **JPanel**,

```
class Canvas extends JPanel {
  ... }
```

and then make this the content pane of the basic frame:

```
JPanel panel = new Canvas(...);
setContentPane(panel);
```


Our canvas typically has two attributes — height and width — and the constructor sets their values and usually the background color (to something other than the default gray)

```
class Canvas extends JPanel {
  public Canvas(int width, int height) {
    setSize(width, height);
    myHeight = height; myWidth = width;
    setBackground(Color.white);
  }

  // at least one other method
  ...
}
```


One other method that must be added is:

```
public void paintComponent(Graphics pen) {
  // statements to paint the component
}
```

The object **pen** of type **Graphics** (from AWT) is what does the actual painting with methods like (see p. 309):

```
drawArc(), drawLine(), drawOval(),
drawRect(), drawString(), drawPolygon()
fillArc(), fillOval(), fillRect(),
fillPolygon(), translate(),
setColor(), setFont()
```


Example: Dutch Flag Applet

(§ 6.5)

Problem: Build an applet to paint an image of the Dutch flag:

```
/** DutchFlag2.java is an applet that draws a Dutch flag
 * Output: A graphic representing the flag of the Netherlands.
 */

import javax.swing.*;        // JApplet, JPanel
import java.awt.*;           // Graphics, Color, ...


public class DutchFlag2 extends JApplet {

 private static final int FLAG_WIDTH  = 350;
 private static final int FLAG_HEIGHT = 200;
 private static final int TITLE_ROWS = 30;

 public DutchFlag2() {

   JPanel flagPanel = new FlagOfHolland(FLAG_WIDTH,
                                        FLAG_HEIGHT);
   setContentPane(flagPanel);
 }
```



```
 public void init()  {

   DutchFlag2 myPicture = new DutchFlag2();
   myPicture.setSize(FLAG_WIDTH, FLAG_HEIGHT + TITLE_ROWS);
   myPicture.setVisible(true);
 }
}

class FlagOfHolland extends JPanel  {

 public FlagOfHolland(int width, int height)
 {
   setSize(width, height);
   myHeight = height;
   myWidth = width;

   // draw white field as background
   setBackground(Color.white);

 }
```



```
public void paintComponent(Graphics pen)  {

   super.paintComponent(pen);

   myHeight = getHeight();
   myWidth = getWidth();

   int stripeHeight = myHeight / 3;

   // draw red stripe
   pen.setColor(Color.red);
   pen.fillRect(0, 0, myWidth, stripeHeight);

   // draw blue stripe
   pen.setColor(Color.blue);
  pen.fillRect(0, stripeHeight * 2, myWidth, myHeight);
 }

 int myHeight, myWidth;
}
```



```
<!-- DutchFlag2.html -->

<HTML>

<HEAD>
</HEAD>

<BODY>

<APPLET CODE="DutchFlag2.class" WIDTH=400 HEIGHT=300 >
</APPLET>

</BODY>
</HTML>
```