4e année IR 2019/20

Object-oriented Programming

Java Swing

S. Yangui (INSA/LAAS)

This hands-on lab takes you through the basics of using Java Swing APIs for building Java-based GUI applications. The sample applications are from Java Tutorials: Creating a GUI with JFC/Swing.

This hands-on lab explains the concepts you need to use Swing components in building a user interface. It first examines the simplest Swing application you can write. This is followed by several progressively complicated examples of creating user interfaces using components in the **javax.swing** package. We cover several Swing components, such as buttons, labels, and text areas. The handling of events is also discussed, as are layout management and accessibility.

Resources:

- Download the Swing projects for this laboratory
- Creating a GUI with JFC/Swing tutorial from Java.oracle.doc

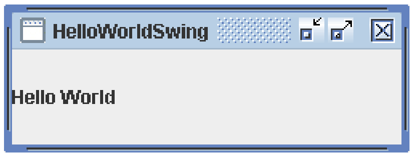
Exercise 1: Build and run "HelloWorldSwing" application

This small example has all the code that every Swing application must have.

1. Start your IDE (e.g. NetBeans –recommended-).
2. Open **HelloWorldSwing** NetBeans project.
   - Select **File->Open Project (Ctrl+Shift+O)**.
   - Observe that the **Open Project** dialog box appears.
   - Browse down to **<LAB_UNZIPPED_DIRECTORY>/lab_swingbasics/samples** directory.
   - Select **HelloWorldSwing**.
   - Click Open **Project**.

- Observe that the **HelloWorldSwing** project node appears under **Projects** tab window.

3. Build and run **HelloWorldSwing** project.
   - Right-click **HelloWorldSwing** project and select **Run**.
   - Observe the GUI displayed.



4. Double-click **HelloWorldSwing.java** under HelloWorldSwing->Source Packages->helloworldswing to open it in the source editor.

   - Read through the code paying attention to the comments.

Exercise 2: Build and run "SwingApplication" sample application

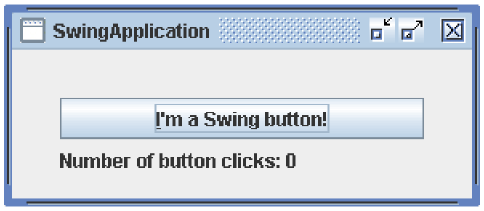
In this step, you are going to exercise how to set "look and feel" of your GUI.

1. Open **SwingApplication** NetBeans project.

   - Select **File**->**Open Project (Ctrl+Shift+O)**. The **Open Project** dialog box appears.
   - Browse down to **<LAB_UNZIPPED_DIRECTORY>/lab_swingbasics/samples** directory.
   - Select **SwingApplication**.
   - Click **Open Project**.
   - Observe that the **SwingApplication** project node appears under **Projects** tab window.

2. Build and run **SwingApplication** project.

   - Right-click **SwingApplication** project and select **Run**.
   - Observe the GUI displayed.



3. Double-click **SwingApplication.java** under **SwingApplication->Source Packages->swingapplication** to open it in the source editor

   - Read through the code.
   - Read explanation of the SwingApplication.java.

4. Change the value of **LOOKANDFEEL** static string to "**Metal**" as shown below

```
public class SwingApplication implements ActionListener {
    private static String labelPrefix = "Number of button clicks: ";
    private int numClicks = 0;
    final JLabel label = new JLabel(labelPrefix + "0    ");

    //Specify the look and feel to use.  Valid values:
    //null (use the default), "Metal", "System", "Motif", "GTK+"
    final static String LOOKANDFEEL = "Metal";
```

5. Build and run **SwingApplication** project.

   - Right-click **SwingApplication** project and select **Run**.
   - Observe the new GUI displayed.

6. Change the value of **LOOKANDFEEL** static string to "**System**", "**Motif**", and "**GTK+**" and run the application and observe that different look and feel is displayed.

Exercise 3: Add another button to the "SwingApplication" sample application

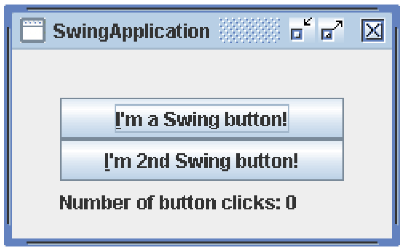
In this step, you are going to add the 2nd button the JPanel. You will also learn how the event handler of the buttons is invoked.

1. Modify the **SwingApplication.java** as shown below. You are adding another button. The code fragments that needed to be added are highlighted in **bold and blue-colored** font.

```
package swingapplication;

/*
 * SwingApplication.java is a 1.4 example that requires
 * no other files.
 */
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;

public class SwingApplication implements ActionListener {
    private static String labelPrefix = "Number of button clicks: ";
    private int numClicks = 0;
    final JLabel label = new JLabel(labelPrefix + "0    ");

    //Specify the look and feel to use.  Valid values:
    //null (use the default), "Metal", "System", "Motif", "GTK+"
    final static String LOOKANDFEEL = null;

    public Component createComponents() {
        JButton button = new JButton("I'm a Swing button!");
        button.setMnemonic(KeyEvent.VK_I);
        button.addActionListener(this);
        label.setLabelFor(button);

        // Create a second button. The same event handler will be used.
        JButton button2 = new JButton("I'm 2nd Swing button!");
        button2.setMnemonic(KeyEvent.VK_L);
        button2.addActionListener(this);
        label.setLabelFor(button2);

        /*
         * An easy way to put space between a top-level container
         * and its contents is to put the contents in a JPanel
         * that has an "empty" border.
         */
        JPanel pane = new JPanel(new GridLayout(0, 1));
        pane.add(button);
        // Add 2nd button to the JPanel
        pane.add(button2);
        pane.add(label);
        pane.setBorder(BorderFactory.createEmptyBorder(
                30, //top
                30, //left
                10, //bottom
                30) //right
                );

        return pane;
    }

    public void actionPerformed(ActionEvent e) {
        numClicks++;
        label.setText(labelPrefix + numClicks);
    }

    private static void initLookAndFeel() {

        // Swing allows you to specify which look and feel your program uses-
-Java,
        // GTK+, Windows, and so on as shown below.
        String lookAndFeel = null;

        if (LOOKANDFEEL != null) {
            if (LOOKANDFEEL.equals("Metal")) {
                lookAndFeel =
UIManager.getCrossPlatformLookAndFeelClassName();
            } else if (LOOKANDFEEL.equals("System")) {
                lookAndFeel = UIManager.getSystemLookAndFeelClassName();
            } else if (LOOKANDFEEL.equals("Motif")) {
                lookAndFeel =
"com.sun.java.swing.plaf.motif.MotifLookAndFeel";
            } else if (LOOKANDFEEL.equals("GTK+")) { //new in 1.4.2
                lookAndFeel = "com.sun.java.swing.plaf.gtk.GTKLookAndFeel";
            } else {
                System.err.println("Unexpected value of LOOKANDFEEL
specified: "
                        + LOOKANDFEEL);
                lookAndFeel =
UIManager.getCrossPlatformLookAndFeelClassName();
            }

            try {
                UIManager.setLookAndFeel(lookAndFeel);
            } catch (ClassNotFoundException e) {
                System.err.println("Couldn’t find class for specified look
and feel:"
                        + lookAndFeel);
                System.err.println("Did you include the L&F library in the
class path?");
                System.err.println("Using the default look and feel.");
            } catch (UnsupportedLookAndFeelException e) {
                System.err.println("Can't use the specified look and feel ("
                        + lookAndFeel
                        + ") on this platform.");
                System.err.println("Using the default look and feel.");
            } catch (Exception e) {
                System.err.println("Couldn't get specified look and feel ("
                        + lookAndFeel
                        + "), for some reason.");
                System.err.println("Using the default look and feel.");
                e.printStackTrace();
            }
        }
    }

    /**
     * Create the GUI and show it.  For thread safety,
     * this method should be invoked from the
     * event-dispatching thread.
     */
    private static void createAndShowGUI() {
        //Set the look and feel.
        initLookAndFeel();

        //Make sure we have nice window decorations.
        JFrame.setDefaultLookAndFeelDecorated(true);

        //Create and set up the window.
        JFrame frame = new JFrame("SwingApplication");
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

        SwingApplication app = new SwingApplication();
        Component contents = app.createComponents();
        frame.getContentPane().add(contents, BorderLayout.CENTER);

        //Display the window.
        frame.pack();
        frame.setVisible(true);
    }
    public static void main(String[] args) {
        //Schedule a job for the event-dispatching thread:
        //creating and showing this application's GUI.
        javax.swing.SwingUtilities.invokeLater(new Runnable() {
            public void run() {
                createAndShowGUI();
            }
        }
    }
}
```

2. Build and run **SwingApplication** project.

   - Right-click **SwingApplication** project and select **Run**.
   - Observe the GUI displayed.



Number of button clicks: 0

3. Play with the event handler

   - Click both buttons.
   - Observe that either button will trigger the "Number of button clicks: <value>" to increase the value.

Now you are going to change the behavior of the event handler depending on which button is pressed.

4. Modify **SwingApplication.java** as shown below. You are changing the behavior of the event handler depending on which button is pressed. The code fragments that needed to be added are highlighted in **bold and blue-colored** font.

```
package swingapplication;

/*
 * SwingApplication.java is a 1.4 example that requires
 * no other files.
 */
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;

public class SwingApplication implements ActionListener {
```

```
private static String labelPrefix = "Number of button clicks: ";
private int numClicks = 0;
final JLabel label = new JLabel(labelPrefix + "0    ");

//Specify the look and feel to use.  Valid values:
//null (use the default), "Metal", "System", "Motif", "GTK+"
final static String LOOKANDFEEL = null;

public Component createComponents() {
    JButton button = new JButton("I'm a Swing button!");
    button.setMnemonic(KeyEvent.VK_I);
    button.addActionListener(this);
    label.setLabelFor(button);

    // Create a second button
    JButton button2 = new JButton("I'm 2nd Swing button!");
    button2.setMnemonic(KeyEvent.VK_I);
    button2.addActionListener(this);
    label.setLabelFor(button2);

    /*
     * An easy way to put space between a top-level container
     * and its contents is to put the contents in a JPanel
     * that has an "empty" border.
     */
    JPanel pane = new JPanel(new GridLayout(0, 1));
    pane.add(button);
    // Add 2nd button to the JPanel
    pane.add(button2);
    pane.add(label);
    pane.setBorder(BorderFactory.createEmptyBorder(
            30, //top
            30, //left
            10, //bottom
            30) //right
            );

    return pane;
}

// Modify the event handler code depending on which button is pressed.
// If the 1st button is pressed, increase the numClicks value by 1, else
// increase the value by 1000.

public void actionPerformed(ActionEvent e) {

    // Using getActionCommand() method is a bit of a hack, but for the
    // sake of this exercise, it serves its purpose.
    if (e.getActionCommand().equals("I'm a Swing button!")){
        numClicks++;
    }
    else{
        numClicks += 1000;
    }
    label.setText(labelPrefix + numClicks);
}
```

```
    private static void initLookAndFeel() {

        // Swing allows you to specify which look and feel your program uses-
-Java,
        // GTK+, Windows, and so on as shown below.
        String lookAndFeel = null;

        if (LOOKANDFEEL != null) {
            if (LOOKANDFEEL.equals("Metal")) {
                lookAndFeel =
UIManager.getCrossPlatformLookAndFeelClassName();
            } else if (LOOKANDFEEL.equals("System")) {
                lookAndFeel = UIManager.getSystemLookAndFeelClassName();
            } else if (LOOKANDFEEL.equals("Motif")) {
                lookAndFeel =
"com.sun.java.swing.plaf.motif.MotifLookAndFeel";
            } else if (LOOKANDFEEL.equals("GTK+")) { //new in 1.4.2
                lookAndFeel = "com.sun.java.swing.plaf.gtk.GTKLookAndFeel";
            } else {
                System.err.println("Unexpected value of LOOKANDFEEL
specified: "
                        + LOOKANDFEEL);
                lookAndFeel =
UIManager.getCrossPlatformLookAndFeelClassName();
            }

            try {
                UIManager.setLookAndFeel(lookAndFeel);
            } catch (ClassNotFoundException e) {
                System.err.println("Couldn't find class for specified look
and feel:"
                        + lookAndFeel);
                System.err.println("Did you include the L&F library in the
class path?");
                System.err.println("Using the default look and feel.");
            } catch (UnsupportedLookAndFeelException e) {
                System.err.println("Can't use the specified look and feel ("
                        + lookAndFeel
                        + ") on this platform.");
                System.err.println("Using the default look and feel.");
            } catch (Exception e) {
                System.err.println("Couldn't get specified look and feel ("
                        + lookAndFeel
                        + "), for some reason.");
                System.err.println("Using the default look and feel.");
                e.printStackTrace();
            }
        }
    }

    /**
     * Create the GUI and show it.  For thread safety,
     * this method should be invoked from the
     * event-dispatching thread.
     */
    private static void createAndShowGUI() {
        //Set the look and feel.
        initLookAndFeel();

        //Make sure we have nice window decorations.
        JFrame.setDefaultLookAndFeelDecorated(true);

        //Create and set up the window.
        JFrame frame = new JFrame("SwingApplication");
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

        SwingApplication app = new SwingApplication();
        Component contents = app.createComponents();
        frame.getContentPane().add(contents, BorderLayout.CENTER);

        //Display the window.
        frame.pack();
        frame.setVisible(true);
    }

    public static void main(String[] args) {
        //Schedule a job for the event-dispatching thread:
        //creating and showing this application’s GUI.
        javax.swing.SwingUtilities.invokeLater(new Runnable() {
            public void run() {
                createAndShowGUI();
            }
        }
    }
}
```

5. Using context-sensitive JavaDoc feature of NetBeans, please see the JavaDoc of **ActionEvent** class.

6. Build and run **SwingApplication** project.

    - Right-click **SwingApplication** project and select **Run**.
    - Observe the number of button clicks changed differently depending on which button you pressed.

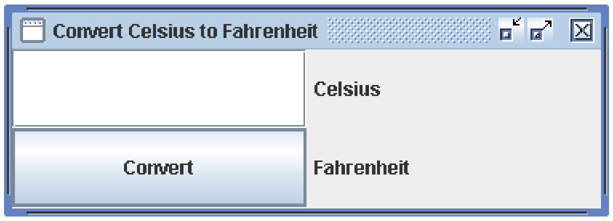
Exercise 4: Build and run "CelsiusConverter" sample application

1. Open **CelsiusConverter** NetBeans project.

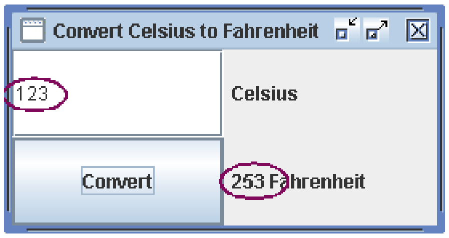
    - Select **File->Open Project (Ctrl+Shift+O)**. The **Open Project** dialog box appears.
    - Browse down to **<LAB_UNZIPPED_DIRECTORY>/lab_swingbasics/samples** directory.
    - Select **CelsiusConverter**.
    - Click **Open Project**.
    - Observe that the **CelsiusConverter** project node appears under **Projects** tab window.

2. Build and run **CelsiusConverter** project.

   - Right-click **CelsiusConverter** project and select **Run**.
   - Observe the GUI displayed.



   - Type some value in the text field and press **Enter** or press **Convert** button.
   - Observe the Celsius value is converted into Fahrenheit.



3. Read explanation of the **CelsiusConverter** application. (This is very important.)

Exercise 5: Build and run Improved "CelsiusConverter2" sample application

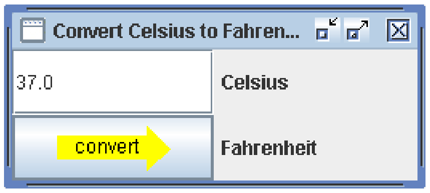
In this exercise, you are going to learn how to use icon image with the application.

1. Open **CelsiusConverter2** NetBeans project.

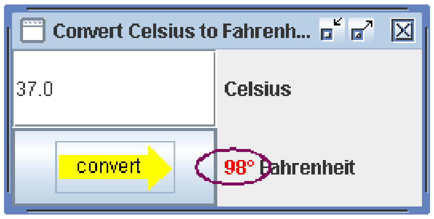
   - Select **File->Open Project (Ctrl+Shift+O)**. The **Open Project** dialog box appears.
   - Browse down to **<LAB_UNZIPPED_DIRECTORY>/lab_swingbasics/samples** directory.
   - Select **CelsiusConverter2**.
   - Click **Open Project**.
   - Observe that the **CelsiusConverter2** project node appears under **Projects** tab window.

2. Build and run **CelsiusConverter2** project.

   - Right-click **CelsiusConverter2** project and select **Run**.
   - Observe the GUI displayed.



- Press converter arrow image.
- Observe the conversion occurs



3. Read explanation of the **CelsiusConverter2** application. (This is very important.)

Exercise 6: Build and run "LunarPhases" sample application

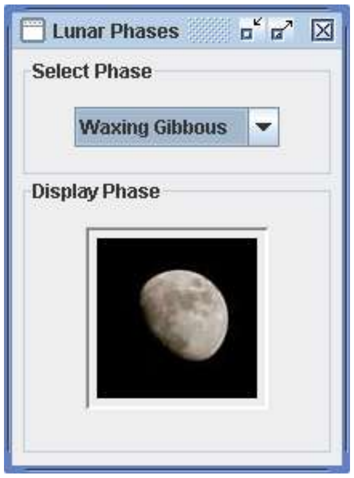
In this exercise, you are going to learn how to handle Layout managers.

1. Open **LunarPhases** NetBeans project.

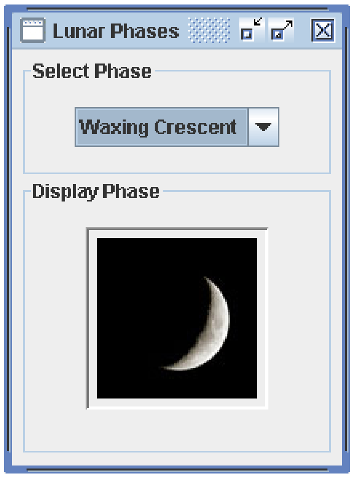
    - Select **File->Open Project (Ctrl+Shift+O)**. The **Open Project** dialog box appears.
    - Browse down to **<LAB_UNZIPPED_DIRECTORY>/lab_swingbasics/samples** directory.
    - Select **LunarPhases**.
    - Click **Open Project**.
    - Observe that the **LunarPhases** project node appears under **Projects** tab window.

2. Build and run **LunarPhases** project.

    - Right-click **LunarPhases** project and select **Run**.
    - Observe the GUI displayed.



- Select **Waxing Crescent** from the drop down menu
- Observe a new image gets displayed



3. Read explanation of the **LunarPhases** application. (This is very important.)

Exercise 6: Build and run "VoteDialog" sample application

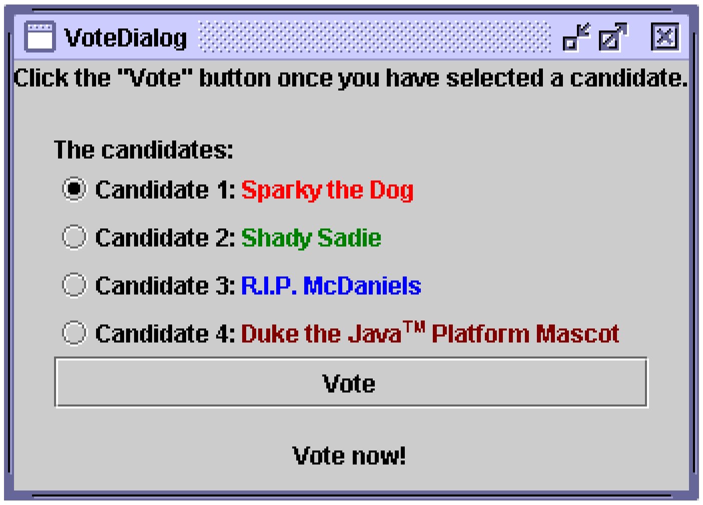
1. Open **VoteDialog** NetBeans project.

   - Select **File->Open Project (Ctrl+Shift+O)**. The **Open Project** dialog box appears.
   - Browse down to **<LAB_UNZIPPED_DIRECTORY>/lab_swingbasics/samples** directory.
   - Select **VoteDialog**.

- Click **Open Project**.
- Observe that the **VoteDialog** project node appears under **Projects** tab window.

2. Build and run **VoteDialog** project.

   - Right-click **VoteDialog** project and select **Run**.
   - Observe the GUI displayed.



Click the "Vote" button once you have selected a candidate.

The candidates:

(●) Candidate 1: Sparky the Dog
( ) Candidate 2: Shady Sadie
( ) Candidate 3: R.I.P. McDaniels
( ) Candidate 4: Duke the Java™ Platform Mascot

Vote now!

3. Read explanation of the **VoteDialog** application. (This is very important.)