CSC131 Fall 2018

Lab: Gaining Experience with GUI Construction

Muhammad Ahmed
Anthony Chavez
Megan Householder
Kevin Huoth
Cameron Larson-Barrera
Sparashdeep Sidhu
Lizzeth Valencia

4/14/21

Inst**ructions:** Answer as many of the following questions as you can during the lab period. If you are unable to complete the assignment during the lab period it is strongly recommended that you complete it on your own.

You may work on this assignment alone or in a group.

Deliverables: Submit 1) screenshots of the interfaces you create and 2) a zip file including all java source code in Canvas.

Getting Ready: Before going any further, you should:

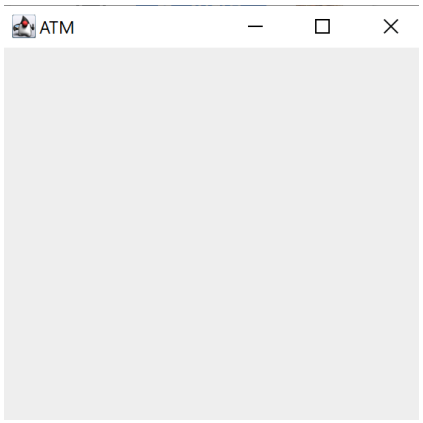
1. Setup your development environment.
2. Download the following files from the lab instruction page on Canvas:

   CashMachine.java
   PINPadWindow.java
   NumberPad.java

   to an appropriate directory/folder. (In most browsers/OSs, the easiest way to do this is by right-clicking/control-clicking on each of the links above.)

1. Working with Windows: This part of the lab will give you some experience with windows.

1. Execute `CashMachine`. What happened?



A window with nothing appeared.

2. Click on the icon that closes the window (which will vary with the operating system you are using). What happened? (Be careful!)

Window closes but application still runs in background

3. Terminate `CashMachine`.

4. Add the following statement to the end of the constructor in the `PINPadWindow` class. `setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);`

```
public PINPadWindow()
{
    super();
    setupLayout();
    setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
}

/**
```

5. Execute `CashMachine` and again click on the icon that closes the window (which will vary with the operating system you are using). What happened now?

Application and window closes

2. Layout: This part of the lab will give you some experience constructing GUI components and working with layout managers.

1. Suppose you needed to layout a `Container` in a table/matrix that contains four rows and three columns. What layout manager would you use?

A GridLayout. Layout manager : new GridLayout(4, 3);

2. Complete the `setupLayout()` method in the `NumberPad` class. Your implementation must contain 12 `JButton` objects and be consistent with the following wireframe.

   What code did you add?

```
private void setupLayout()
{

    setLayout(new GridLayout(4, 3));

    for (int i=1; i<=9; i++) addButton(String.format("%1d", i));
    addButton("\u232B");
    addButton("0");
    addButton("C");
}
```

3. Your implementation may include duplicate code. If so, correct your implementation by adding one or more private methods (and, perhaps, a "constant"). What does your code look like now?

```
private static final Font BUTTON_FONT = new Font("Courier", Font.PLAIN, 12);



private void addButton(String text)
{
    JButton      button;
    button = new JButton(text);
    button.setFont(BUTTON_FONT);
    add(button);
}

private void setupLayout()
{

    setLayout(new GridLayout(4, 3));

    for (int i=1; i<=9; i++) addButton(String.format("%1d", i));
    addButton("\u232B");
    addButton("0");
    addButton("C");
}
```

4. Modify the `setupLayout()` method **in the `PINPadWindow`** class so that it now constructs a `NumberPad` and adds it to the content pane. What code is in the `setupLayout()` method now?

```
/
private void setupLayout()
{
    Container     contentPane;
    NumberPad     numberPad;

    setSize(300, 300);
    setTitle("ATM");

    contentPane = getContentPane();
    numberPad = new NumberPad();
    contentPane.add(numberPad);
}
```

5.

Execute `CashMachine`. How big is the window and how big are the buttons? .
Terminate `CashMachine`.
Window is 300x300.

```
setSize(300, 300);
```

Button approximately 100x75

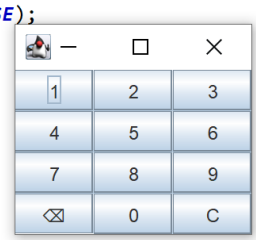
6.Add the following to the bottom of the constructor in the `PINPadWindow` class.

pack();

Execute `CashMachine`. How big is the window now?

Window became smaller

```
EXIT_ON_CLOSE);
```



Resize the window. What happens and why?
Gridlayout alls the buttons to become bigger if the window is resized.

8.

9. Add the following to the bottom of the constructor in the `PINPadWindow` class. `setResizable(false);`

Execute `CashMachine`. Can you re-size the window?

No, we do not have access to re-size window anymore.

3. Specializing GUI Components: This part of the lab will give you some experience adding capabilities to GUI components using specialization.

1. Create a `Display` class that specializes the `JLabel` class. The default constructor must call the single-parameter constuctor in the parent class passing it `" "` and then call the `setBorder()` method passing it an etched border.

   What code is in the class?

```java
package GuiConstruction;

import javax.swing.*;

public class Display extends JLabel
{
    public Display()
    {
        super(" ");
        setBorder(BorderFactory.createEtchedBorder());
    }
}
```

4. More Layout: This part of the lab will give you more experience with layout.

1. Modify the `setupLayout()` method in the `PINPadWindow` class so that it adds a `Display` above the `NumberPad` in a fashion that is consistent with the following wireframe.

   What code is in this method now? (Note: Remember to construct an appropriate layout manager and pass it to `setLayout()`.)

```java
    private void setupLayout()
    {
        Container     contentPane;
        NumberPad     numberPad;
        Display display;

        setSize(300, 300);
        setTitle("ATM");

        contentPane = getContentPane();
        contentPane.setLayout(new BorderLayout());
        display = new Display();
        contentPane.add(display, BorderLayout.NORTH);

        numberPad = new NumberPad();
        contentPane.add(numberPad, BorderLayout.CENTER);
        pack();


        setResizable(false);
    }
```

5. Event-Driven Programming: This part of the lab will give you some experience with event-driven programming.

1. Modify the `Display` class so that it now realizes the `ActionListener` interface. Specifically, it should respond to `ActionEvent` objects that have an action command of `"C"` by clearing its contents (i.e., by setting its text to `" "`) and any other `ActionEvent` objects by appending the action command to its current contents.

   What code is in this class now?

```java
package GuiConstruction;

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

public class Display extends    JLabel
implements ActionListener{
    private static final String     CLEAR = "C";

    public Display(){
        super(" ");
        setBorder(BorderFactory.createEtchedBorder());
    }

    public void actionPerformed(ActionEvent ae){
        String ac;
        ac = ae.getActionCommand();
        if (ac.equals(CLEAR))
            setText(" ");
        else
            setText(getText()+ac);
    }
}
```

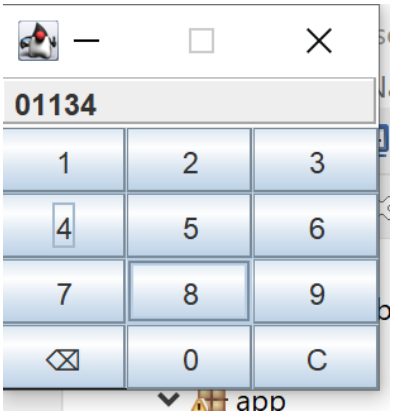
2. Modify the constructor in the `NumberPad` class so that it is now passed an `ActionListener` object that it stores in a private attribute named `listener`, before calling `setupLayout()`. What code is in the constructor now?

```
public class NumberPad extends     JPanel
{

    private ActionListener listener;



    /**
     * Default Constructor
     */
    public NumberPad(ActionListener listener)
    {
        super();
        this.listener = listener;
        setupLayout();
    }

    /**
     * Setup and layout this NumberPad
     */
```

3.Modify the `addButton()` method in the `NumberPad` class so that it makes `listener` an `ActionListener` on the button it is adding.

What code did you add?

```java
private void addButton(String text)
{
    JButton      button;
    button = new JButton(text);
    button.setFont(BUTTON_FONT);
    add(button);
    button.addActionListener(listener);
}
```



4. Modify the setupLayout() method in the PINPadWindow class so that the Display is now an ActionListener on the NumberPad.

What code did you change?

```java
numberPad = new NumberPad(display);
```

5.Execute CashMachine. What happens when you click on the various buttons

All the buttons work except for the erase to the left button.

6. Modify the Display class so that the text is aligned to the right. What change did youmake?

```java
public class Display extends JLabel implements ActionListener
{
    private static final String     CLEAR = "C";
    public Display()
    {
        super(" ", SwingConstants.RIGHT);
        setBorder(BorderFactory.createEtchedBorder());
    }
```

I added SwingConstants.RIGHT

7. Now, modify the `Display` so that:

1. The "Del" button works as expected.
2. When the `Display` is empty it displays the text `"Enter your PIN"`.
3. When the `Display` is not empty it shows (an appropriate numebr of) asterisks rather than the PIN.

What code is in your `Display` class now?

```
    private static final String     CLEAR = "C";
    private String contents;
    private static final String     ERASE_TO_THE_LEFT = "\u232B";
    public Display()
    {

        super(" ", SwingConstants.RIGHT);
        setBorder(BorderFactory.createEtchedBorder());
        contents = "";
        updateDisplay();
    }

    public void actionPerformed(ActionEvent ae)
    {
        String        ac;

        ac = ae.getActionCommand();

        if (ac.equals(CLEAR))
        {
            contents = "";
            setText("Enter your PIN");
        }
        else if (ac.equals(ERASE_TO_THE_LEFT))
        {
            if (!contents.equals(""))
                contents = contents.substring(0, contents.length()-1);
        }
        else
        {
            contents += ac;
        }
        updateDisplay();
    }

    private void updateDisplay()
    {
        if (contents.equals("")) setText("Enter your PIN");
        else
        {
            String    asterisks = "";

            for (int i=0; i<contents.length(); i++) asterisks += "*";
            setText(asterisks);
        }
    }
}
```

8. Now, modify the `Display` so that the text is gray when "Enter your PIN" is displayed and red when the asterisks are displayed. What code did you change?

```
    private void updateDisplay()
    {
        if (contents.equals(""))
        {
            setForeground(Color.GRAY);
            setText("Enter your PIN");
        }
        else
        {
            String    asterisks = "";

            for (int i=0; i<contents.length(); i++) asterisks += "*";
            setForeground(Color.RED);
            setText(asterisks);
        }
    }
}
```