

## Introduction to Computer Programming (Java A)

### Lab 13

#### [Objective]

- Learn basic GUI programming

#### [Exercises]

1. The following is a simple example of displaying a .jpg file with swing API.

Copy the following code to DisplayJpg.java

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

public class DisplayJpg
{
    public static void main(String[] args)
    {
        JFrame window=new JFrame(); //create a Frame
        ImageIcon picture=new ImageIcon("C:\\Users\\todd\\Desktop\\a.jpg");
        //load a picture from computer
        JLabel label=new JLabel(picture); //add the picture to a label

        window.add(label); //add the label to the frame
        window.setVisible(true); //Set the window to visible
        window.setSize(400,400); //set the size of the window
        window.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE); //let the
        window can be close by click "x"
    }
}
```

Save a .jpg file to your PC and modify the path to your .jpg file in the above code.

Compile and run the program.

Now if your .jpg file is too large, the window cannot display it in full size.

It was because we hardcode the size when we set the window:

```
window.setSize(400,400);
```

Can you modify the code so that it can set the window size to the size of your image?

Hints: Look for the functions from class **ImageIcon** to get back the size of the image.

Next, can you rescale your image to 50% of its size and display it?

Hints: obtain an object of class **Image** from your existing **ImageIcon** object and use `getScaledInstance()` from class **Image**.

2. Fill in the code below to implement the following functions:
- Draw a circle in the center of the canvas (画布)
  - Increase the radius of the circle by 10% with a click of the Enlarge button
  - Decrease the radius of the circle by 10% with a click of the Shrink button.

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

public class ControlCircle extends JFrame {
    private JButton jbtEnlarge = new JButton("Enlarge");
    private JButton jbtShrink = new JButton("Shrink");
    private CirclePanel canvas = new CirclePanel();

    public ControlCircle() {
        JPanel panel = new JPanel(); // Use the panel to group buttons
        panel.add(jbtEnlarge);
        panel.add(jbtShrink);

        this.add(canvas, BorderLayout.CENTER); // Add canvas to center
        this.add(panel, BorderLayout.SOUTH); // Add buttons to the frame

        // Fill in the code to listen to the action event
    }

    /** Main method */
    public static void main(String[] args) {
        JFrame frame = new ControlCircle();
        frame.setTitle("ControlCircle2");
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.setSize(400, 400);

        frame.setVisible(true);
    }

    class Listener implements ActionListener {
        public void actionPerformed(ActionEvent e) {

            // Fill in the code to response the enlarge or shrink event
        }
    }
}

class CirclePanel extends JPanel {
    private int radius = 50; // Default circle radius

    /** Enlarge the circle */
```

```

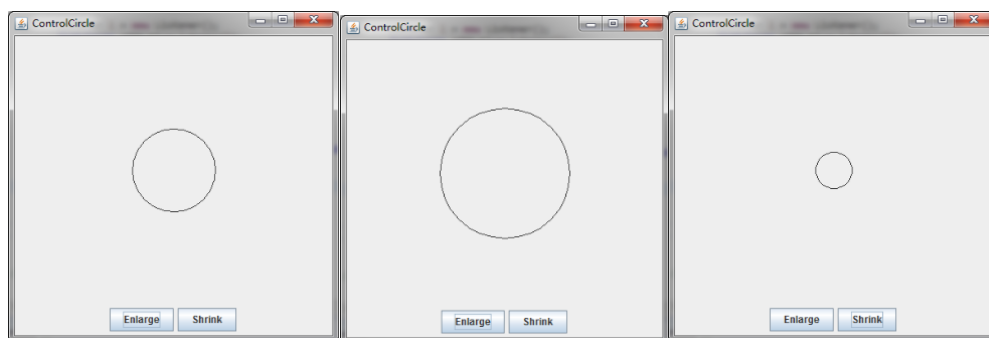
    public void enlarge() {
        radius = (int)(radius * 1.1);
        this.repaint();
    }

    /** Enlarge the circle */
    public void shrink() {
        radius = (int)(radius * 0.9);
        this.repaint();
    }

    /** Repaint the circle */
    protected void paintComponent(Graphics g) {
        super.paintComponent(g);
        // Fill in the code to draw a circle in the center of the canvas with
        the radius of this class
        
    }
}

```

Here is a sample run.



- Understand the following code and fill in the actionPerformed() method to implement the plus and minus operation.

```

import java.awt.BorderLayout;
import java.awt.GridLayout;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;

import javax.swing.JButton;
import javax.swing.JFrame;
import javax.swing.JPanel;
import javax.swing.JTextField;

public class Calculation extends JFrame {
    private JButton plainJButton1;
    private JButton plainJButton2;
    private JButton plainJButton3;
    private JButton plainJButton4;
    private JButton plainJButton5;
    private JButton plainJButton6;

```

```
private JButton plainJButton7;
private JButton plainJButton8;
private JButton plainJButton9;
private JButton plainJButton0;
private JButton plainJButtonAdd;
private JButton plainJButtonSub;
private JButton plainJButtonEq;

private JTextField answer;

private String operation1 = "";
private String operation2 = "";
private String operator = "";

// ButtonFrame adds JButtons to JFrame
public Calculation() {
    super( "Calculator" );
    JPanel jp = new JPanel();
    jp.setLayout( new GridLayout(4,4) );

    plainJButton1 = new JButton( "1" );
    jp.add( plainJButton1 );

    plainJButton2 = new JButton( "2" );
    jp.add( plainJButton2 );

    plainJButton3 = new JButton( "3" );
    jp.add( plainJButton3 );

    plainJButton4 = new JButton( "4" );
    jp.add( plainJButton4 );

    plainJButton5 = new JButton( "5" );
    jp.add( plainJButton5 );

    plainJButton6 = new JButton( "6" );
    jp.add( plainJButton6 );

    plainJButton7 = new JButton( "7" );
    jp.add( plainJButton7 );

    plainJButton8 = new JButton( "8" );
    jp.add( plainJButton8 );

    plainJButton9 = new JButton( "9" );
    jp.add( plainJButton9 );

    plainJButton0 = new JButton( "0" );
    jp.add( plainJButton0 );

    plainJButtonAdd = new JButton( "+" );
    jp.add( plainJButtonAdd );

    plainJButtonSub = new JButton( "-" );
    jp.add( plainJButtonSub );

    plainJButtonEq = new JButton( "=" );
    jp.add( plainJButtonEq );
```

```

        add(jp, BorderLayout.SOUTH);

        answer = new JTextField("");
        answer.setEditable(false);
        answer.setHorizontalAlignment(JTextField.RIGHT);
        add(answer, BorderLayout.CENTER);

        // create new ButtonHandler for button event handling
        ButtonHandler handler = new ButtonHandler();
        plainJButton1.addActionListener( handler );
        plainJButton2.addActionListener( handler );
        plainJButton3.addActionListener( handler );
        plainJButton4.addActionListener( handler );
        plainJButton5.addActionListener( handler );
        plainJButton6.addActionListener( handler );
        plainJButton7.addActionListener( handler );
        plainJButton8.addActionListener( handler );
        plainJButton9.addActionListener( handler );
        plainJButton0.addActionListener( handler );
        plainJButtonAdd.addActionListener( handler );
        plainJButtonSub.addActionListener( handler );
        plainJButtonEq.addActionListener( handler );
    } // end ButtonFrame constructor

    public int compute(String operation1, String operation2, String operator)
    {
        int a = Integer.parseInt(operation1);
        int b = Integer.parseInt(operation2);
        if (operator.charAt(0) == '+') {
            return a + b;
        } else {
            return a - b;
        }
    }

    public static void main( String[] args ) {
        Calculation calculationFrame = new Calculation(); // create
ButtonFrame
        calculationFrame.setDefaultCloseOperation( JFrame.EXIT_ON_CLOSE );
        calculationFrame.setLocationRelativeTo(null);
        calculationFrame.pack(); // set frame size
        calculationFrame.setVisible( true ); // display frame
    } // end main

    // inner class for button event handling
    private class ButtonHandler implements ActionListener {
        // handle button event
        public void actionPerformed((ActionEvent event) {
            // Fill in the code
            
        } // end method actionPerformed
    } // end private inner class ButtonHandler
} // end class ButtonFrame

```

Here is a sample run.

