

# CS102A Introduction to Computer Programming

## Fall 2020

### Lab 13

## Objectives

1. Learn basic GUI programming

## 1 Exercises

### 1.1 Exercise 1

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

DisplayJpg.java

```
1 import javax.swing.*;
2 import java.awt.*;
3
4 public class DisplayJpg
5 {
6     public static void main(String[] args)
7     {
8         JFrame window=new JFrame(); //create a Frame
9         ImageIcon picture=new ImageIcon("C:\\Users\\todd\\Desktop\\a.
            jpg"); //load a picture from computer
10        JLabel label=new JLabel(picture); //add the picture to a
            label
11
```

```

12     window.add(label); //add the label to the frame
13     window.setVisible(true); //Set the window to visible
14     window.setSize(400,400); //set the size of the window
15     window.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE); //let
        the window can be close by click "x"
16 }
17 }

```

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?

### Hint

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?

### Hint

Obtain an object of class `Image` from your existing `ImageIcon` object and use `getScaledInstance()` from class `Image`.

## 1.2 Exercise 2

Fill in the code below to implement the following functions:

1. Draw a circle in the center of the canvas (画布).
2. Increase the radius of the circle by 10% with a click of the Enlarge button.
3. Decrease the radius of the circle by 10% with a click of the Shrink button.

```

1 import java.awt.*;
2 import java.awt.event.*;
3 import javax.swing.*;
4
5 public class ControlCircle extends JFrame {
6     private JButton jbtEnlarge = new JButton("Enlarge");
7     private JButton jbtShrink = new JButton("Shrink");
8     private CirclePanel canvas = new CirclePanel();
9
10    public ControlCircle() {
11        JPanel panel = new JPanel(); // Use the panel to group
            buttons
12        panel.add(jbtEnlarge);
13        panel.add(jbtShrink);
14
15        this.add(canvas, BorderLayout.CENTER); // Add canvas to
            center
16        this.add(panel, BorderLayout.SOUTH); // Add buttons to the
            frame
17
18        // Fill in the code to listen to the action event
19        //
20        //
21
22    }
23
24    /** Main method */
25    public static void main(String[] args) {
26        JFrame frame = new ControlCircle();
27        frame.setTitle("ControlCircle2");
28        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
29        frame.setSize(400, 400);

```

```

30
31     frame.setVisible(true);
32 }
33
34 class Listener implements ActionListener {
35     public void actionPerformed(ActionEvent e) {
36
37 // Fill in the code to response the enlarge or shrink event
38 //
39 //
40
41     }
42 }
43 }
44
45
46 class CirclePanel extends JPanel {
47     private int radius = 50; // Default circle radius
48
49     /** Enlarge the circle */
50     public void enlarge() {
51         radius = (int)(radius * 1.1);
52         this.repaint();
53     }
54
55     /** Enlarge the circle */
56     public void shrink() {
57         radius = (int)(radius * 0.9);
58         this.repaint();
59     }
60
61     /** Repaint the circle */
62     protected void paintComponent(Graphics g) {

```

```

63     super.paintComponent(g);
64
65 // Fill in the code to draw a circle in the center of the canvas
    with the radius of this class
66 //
67 //
68
69 }
70 }

```

### 1.3 Exercise 3

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

```

1 import java.awt.BorderLayout;
2 import java.awt.GridLayout;
3 import java.awt.event.ActionEvent;
4 import java.awt.event.ActionListener;
5
6 import javax.swing.JButton;
7 import javax.swing.JFrame;
8 import javax.swing.JPanel;
9 import javax.swing.JTextField;
10
11 public class Calculation extends JFrame {
12     private JButton plainJButton1;
13     private JButton plainJButton2;
14     private JButton plainJButton3;
15     private JButton plainJButton4;
16     private JButton plainJButton5;
17     private JButton plainJButton6;
18     private JButton plainJButton7;
19     private JButton plainJButton8;

```

```
20 private JButton plainJButton9;
21 private JButton plainJButton0;
22 private JButton plainJButtonAdd;
23 private JButton plainJButtonSub;
24 private JButton plainJButtonEq;
25
26 private JTextField answer;
27
28 private String operation1 = "";
29 private String operation2 = "";
30 private String operator = "";
31
32 // ButtonFrame adds JButtons to JFrame
33 public Calculation() {
34     super( "Calculator" );
35     JPanel jp = new JPanel();
36     jp.setLayout( new GridLayout(4,4) );
37
38     plainJButton1 = new JButton( "1" );
39     jp.add( plainJButton1 );
40
41     plainJButton2 = new JButton( "2" );
42     jp.add( plainJButton2 );
43
44     plainJButton3 = new JButton( "3" );
45     jp.add( plainJButton3 );
46
47     plainJButton4 = new JButton( "4" );
48     jp.add( plainJButton4 );
49
50     plainJButton5 = new JButton( "5" );
51     jp.add( plainJButton5 );
52
```

```
53 plainJButton6 = new JButton( "6" );
54 jp.add( plainJButton6 );
55
56 plainJButton7 = new JButton( "7" );
57 jp.add( plainJButton7 );
58
59 plainJButton8 = new JButton( "8" );
60 jp.add( plainJButton8 );
61
62 plainJButton9 = new JButton( "9" );
63 jp.add( plainJButton9 );
64
65 plainJButton0 = new JButton( "0" );
66 jp.add( plainJButton0 );
67
68 plainJButtonAdd = new JButton( "+" );
69 jp.add( plainJButtonAdd );
70
71 plainJButtonSub = new JButton( "-" );
72 jp.add( plainJButtonSub );
73
74 plainJButtonEq = new JButton( "=" );
75 jp.add( plainJButtonEq );
76
77 add(jp, BorderLayout.SOUTH);
78
79 answer = new JTextField("");
80 answer.setEditable(false);
81 answer.setHorizontalAlignment(JTextField.RIGHT);
82 add(answer, BorderLayout.CENTER);
83
84 // create new ButtonHandler for button event handling
85 ButtonHandler handler = new ButtonHandler();
```

```

86     plainJButton1.addActionListener( handler );
87     plainJButton2.addActionListener( handler );
88     plainJButton3.addActionListener( handler );
89     plainJButton4.addActionListener( handler );
90     plainJButton5.addActionListener( handler );
91     plainJButton6.addActionListener( handler );
92     plainJButton7.addActionListener( handler );
93     plainJButton8.addActionListener( handler );
94     plainJButton9.addActionListener( handler );
95     plainJButton0.addActionListener( handler );
96     plainJButtonAdd.addActionListener( handler );
97     plainJButtonSub.addActionListener( handler );
98     plainJButtonEq.addActionListener( handler );
99 } // end ButtonFrame constructor
100
101 public int compute(String operation1, String operation2, String
102     operator) {
103     int a = Integer.parseInt(operation1);
104     int b = Integer.parseInt(operation2);
105     if (operator.charAt(0) == '+') {
106         return a + b;
107     } else {
108         return a - b;
109     }
110 }
111
112 public static void main( String[] args ) {
113     Calculation calculationFrame = new Calculation(); // create
114     ButtonFrame
115     calculationFrame.setDefaultCloseOperation( JFrame.
116         EXIT_ON_CLOSE );
117     calculationFrame.setLocationRelativeTo(null);
118     calculationFrame.pack(); // set frame size

```



```
116     calculationFrame.setVisible( true ); // display frame
117 } // end main
118
119 // inner class for button event handling
120 private class ButtonHandler implements ActionListener {
121     // handle button event
122     public void actionPerformed((ActionEvent event) {
123
124 // Fill in the code
125 //
126 //
127
128     } // end method actionPerformed
129 } // end private inner class ButtonHandler
130 } // end class ButtonFrame
```