

Week 10, Lecture 2

Building a Calculator



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Announcements

- **Lab Assessments 6 and 7** are due **today**.
- **Assignment 3** is due at the end of next week; deadline is **4pm Friday October 15th**.
- The **Prac Exams** will be held in **Week 13**. See the course web page for a provisional timetable and information about your session.

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Week 10

Java Genesis:

–Ch10: Graphical components

Lab Assessment 8 (deadline **Week 12**)

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Specifying the Calculator

We need to specify both the **design** and **functionality** of the calculator.

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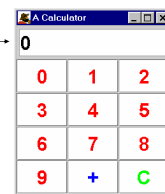
Calculator Design

We need to specify the number, type and layout of the GUI components, i.e. list all the action buttons and text fields and decide where to position them.

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Specifying the Design

text field to display results



10 action buttons to enter data

2 action buttons to process data

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Calculator Functionality

We need to specify how the calculator works, i.e. describe exactly what happens when any button is pressed in any situation.

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Example

| button press | display |
|-----------------|---------|
| | 0 |
| 7 | 7 |
| 3 | 73 |
| + | 73 |
| 2 | 2 |
| + | 75 |
| C | 0 |

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Specifying Functionality

- When a number button is pressed the associated digit is appended to the end of the sequence of digits in the display, except in the following cases:
 - if the previously pressed button was + the associated digit alone is shown in the display;
 - if 0 is pressed when 0 is being displayed, the display continues to show just 0.

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Specifying Functionality (cont)

- There is a (hidden) register that records the 'sum so far'. Initially the register is 0.

continued....

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Specifying Functionality (cont)

- When + is pressed the integer in the register is added to the display. This sum is then
 - shown in the display, and
 - stored in the register.

continued....

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Specifying Functionality (cont)

- When C is pressed
 - 0 is shown in the display, and
 - 0 is stored in the register.

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```

public class Main {
    public static void main (String [ ] args) {
        Calculator calcWin = new Calculator ();
        calcWin.setVisible(true);
    }
}

```

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```

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

public class Calculator extends JFrame {

    // instance variables
    private JTextField display =
        new JTextField("0", 9);
    private JButton [ ] numButs =
        new JButton [10];
    private JButton plus = new JButton("+");
    private JButton clear = new JButton("C");
    private int register = 0;
    private boolean start = true;
}

```

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```

// constructor
public Calculator ( ) {
    setTitle("A Calculator");
    setBounds(400, 200, 250, 300);
    Container c = getContentPane();
    display.setEditable(false);
    display.setFont
        (new Font("SansSerif", Font.BOLD, 30));
    display.setBackground(Color.white);
    JPanel pTop = new JPanel ( );
    pTop.add(display);
    c.add(pTop, "North");
    JPanel pBot = new JPanel ( );
    pBot.setLayout(new GridLayout(4, 3));
}

```

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```

for (int i=0; i<10; i++) {
    numButs[i] = new JButton(""+i);
    numButs[i].setFont
        (new Font("SansSerif", Font.BOLD, 30));
    numButs[i].setBackground(Color.white);
    numButs[i].setForeground(Color.red);
    numButs[i].addActionListener(new ActionListener ( ) {
        public void actionPerformed(ActionEvent e) {
            String butVal = e.getActionCommand();
            if (start || display.getText().equals("0"))
                display.setText(butVal);
            else display.setText(display.getText()+butVal);
            start = false;
        }
    });
    pBot.add(numButs[i]);
}
}

```

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```

plus.setFont (new Font("SansSerif", Font.BOLD, 30));
plus.setBackground(Color.white);
plus.setForeground(Color.blue);
plus.addActionListener(new ActionListener ( ) {
    public void actionPerformed(ActionEvent e) {
        int displayVal = Integer.parseInt(display.getText());
        register = register + displayVal;
        display.setText(""+register);
        start = true;
    }
});
pBot.add(plus);
}

```

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```

clear.setFont(new Font("SansSerif", Font.BOLD, 30));
clear.setBackground(Color.white);
clear.setForeground(Color.green);
clear.addActionListener(new ActionListener ( ) {
    public void actionPerformed(ActionEvent e) {
        register = 0;
        display.setText(""+0);
        start = true;
    }
});
pBot.add(clear);
c.add(pBot, "Center");
}
}

```

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