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COMPSCI 230

Software Design and Construction

User Interface Modeling

2013-04-29

The Standish "Chaos" Report

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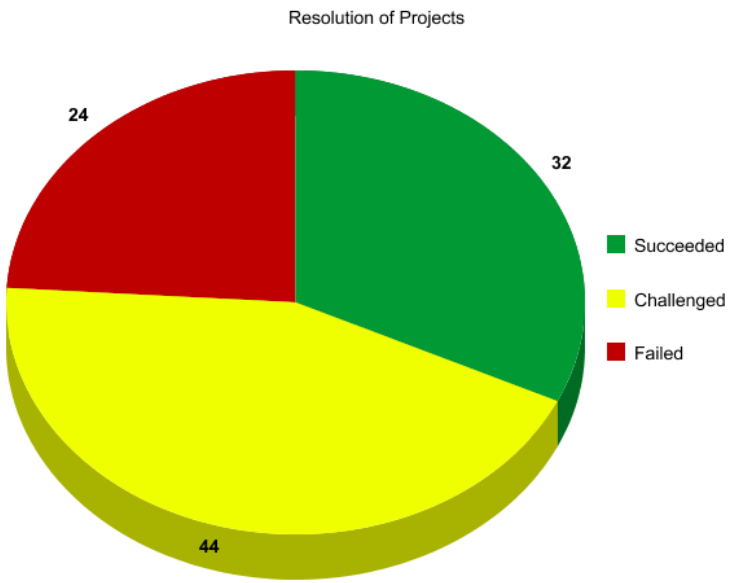
Reports on statistics about IT projects (data for 2009)

32% of all projects succeeded (delivered on time, on budget, with required features and functions)

44% are challenged (late, over budget and/or with less than the required features and functions)

24% have failed (cancelled prior to completion or delivered and never used)



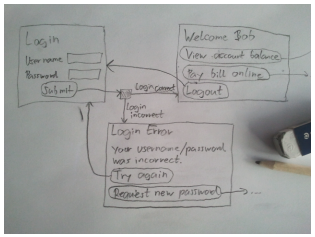
Among the suspected causes:
poor estimates
and poor planning

http://blog.standishgroup.com/

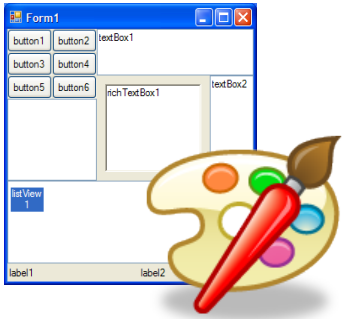
Today's Outline

1. More Swing Widgets

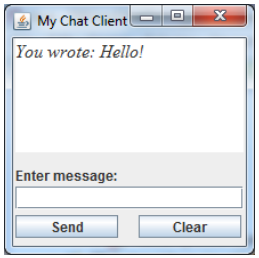
2. User Interface Modeling



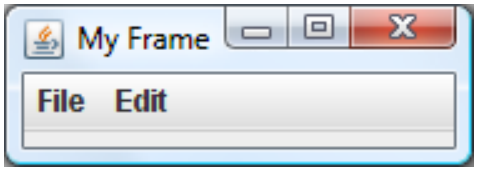
3. GUI Builders: WindowBuilder for Eclipse



4. User Interface Prototypes ("Click Dummies")



More Swing Widgets



Scrollbar Example Part 1

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

public class ScrollBarExample extends JFrame {
  JPanel panel;
  JTextArea area;
  final JTextField field;
  JScrollPane scrollpane;

  public static void main(String[] args) {
    ScrollBarExample v = new ScrollBarExample();
    v.setVisible(true);
  }


  public ScrollBarExample() {
    // see next slide…
  }
}
```

Scrollbar Example Part 2

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```
public ScrollBarExample() {
  super("ScrollBarExample");
  setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
  setSize(100, 130);

  field = new JTextField();
  area = new JTextArea("...", 3, 7);
  scrollpane = new JScrollPane(area);
  scrollpane.getHorizontalScrollBar()
    .addAdjustmentListener(new AdjustmentListener(){
      public void adjustmentValueChanged(AdjustmentEvent e){
              field.setText("Position=" + e.getValue());
      }
  });

  panel = new JPanel();
  panel.add(field); panel.add(scrollpane);
  add(panel);
}
```

Containment Hierarchy of a Menu

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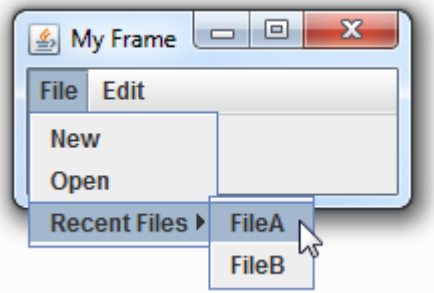
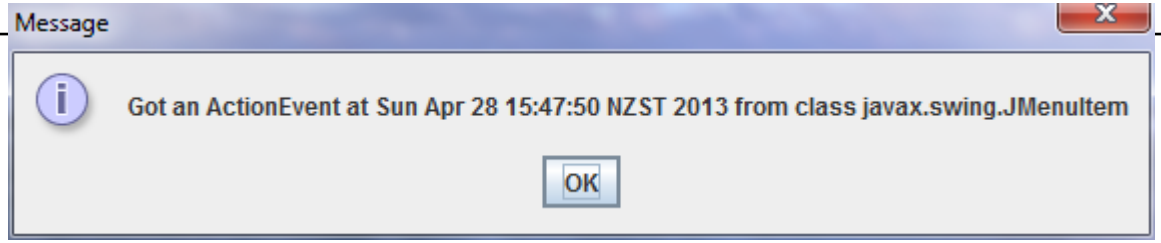
```
…
public class MenuExample extends JFrame {
    public MenuExample() {
        super("My Frame");
        setSize(200, 100);
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

        JMenu fileMenu = new JMenu("File");
        fileMenu.add(new JMenuItem("New"));
        fileMenu.add(new JMenuItem("Open"));

        JMenu recentFilesMenu = new JMenu("Recent Files");
        recentFilesMenu.add(new JMenuItem("FileA"));
        recentFilesMenu.add(new JMenuItem("FileB"));
        fileMenu.add(recentFilesMenu);

        JMenu editMenu = new JMenu("Edit");
        editMenu.add(new JMenuItem("Undo"));
        editMenu.add(new JMenuItem("Redo"));

        JMenuBar menubar = new JMenuBar();
        menubar.add(fileMenu);
        menubar.add(editMenu);

        setJMenuBar(menubar);
}   }
```

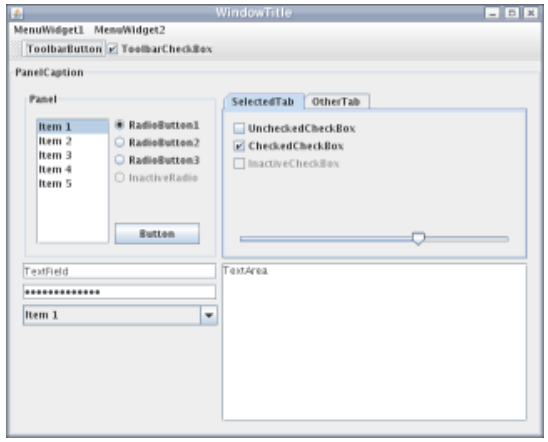


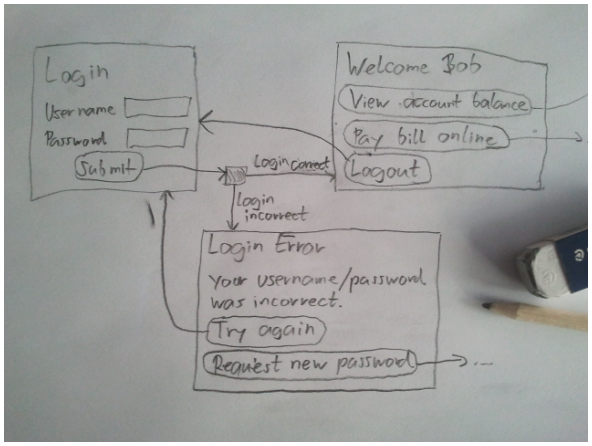
Handling Menu Events


```
...
final JFrame frame = this;
JMenuItem openMenuItem = new JMenuItem("Open");
fileMenu.add(openMenuItem);
openMenuItem.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        JOptionPane.showMessageDialog(frame,
            "Got an ActionEvent at "
            + new Date(e.getWhen()) + " from "
            + e.getSource().getClass());
    }
});
...
```



User Interface Modeling





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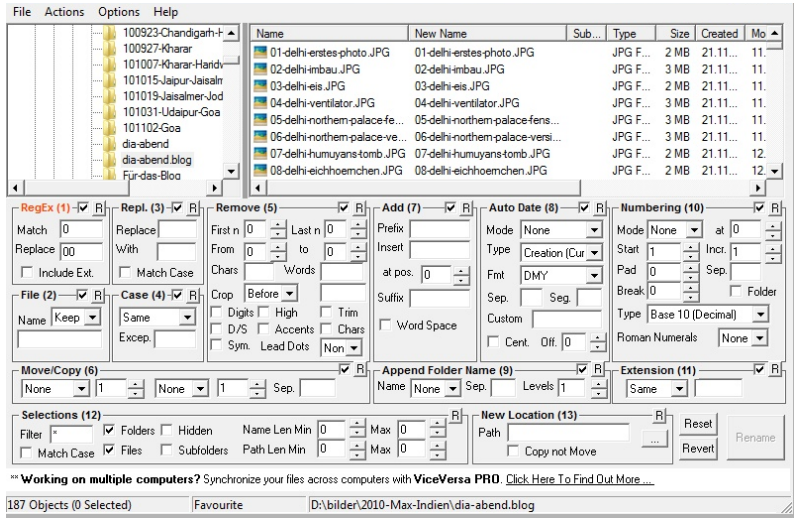
User Interfaces (UIs)

User interfaces are the interfaces between humans and computers

- **Input**: “How does the user talk to the system?“
- **Output**: “How does the system talk to the user?“
- **Interaction:** input and output between human and computer over time (HCI=Human-Computer Interaction)

The UI is a **crucial part** of a system

- Functionality is useless if users don‘t know how to use it
- Users won‘t use it if usage is cumbersome

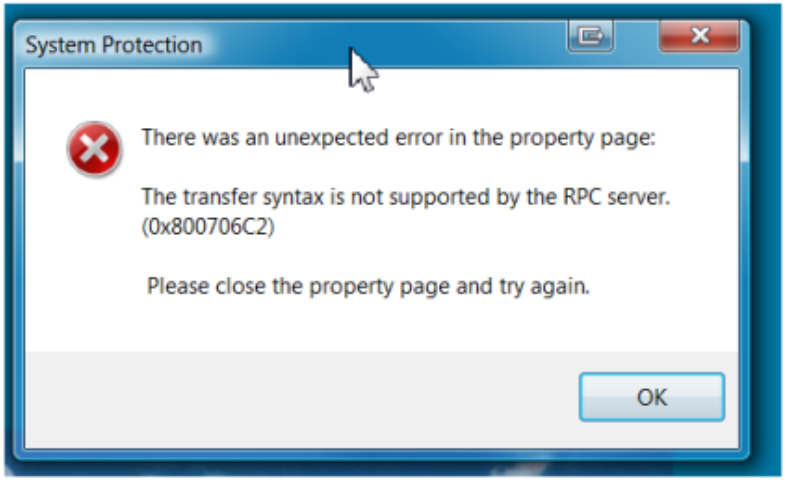


Usability

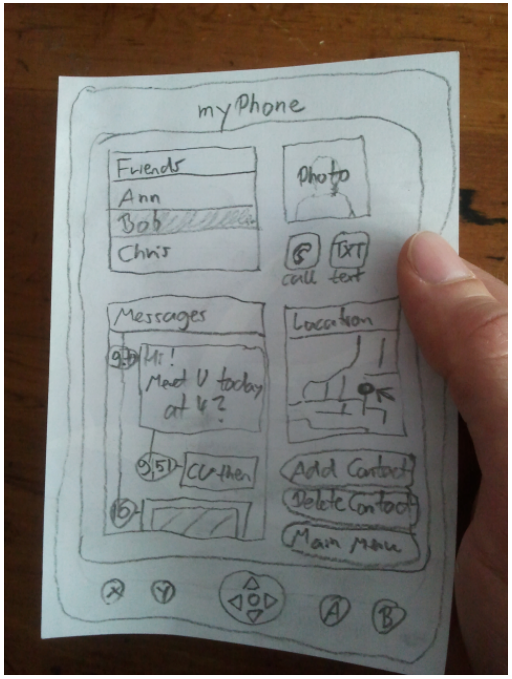
ISO 9241 definition:
"The **effectiveness**, **efficiency**, and **satisfaction** with which specified *users* achieve specified *goals* in particular *environments*."

Some **usability heuristics**
(by Jacob Nielsen http://www.useit.com/papers/heuristic)

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Error prevention
- Help users recognize, diagnose, and recover from errors



Introduction to Modeling



Software is complex !!!
How can we deal with it?

Common solution: use a **good representation**

Model: represents certain properties
of an object in a different context

- Abstraction: reduce complexity
  by taking away unnecessary details
- Clarity: make interesting properties more visible
- Facilitate application of a methodology
- Usability (e.g. easy to create, change, understand…)

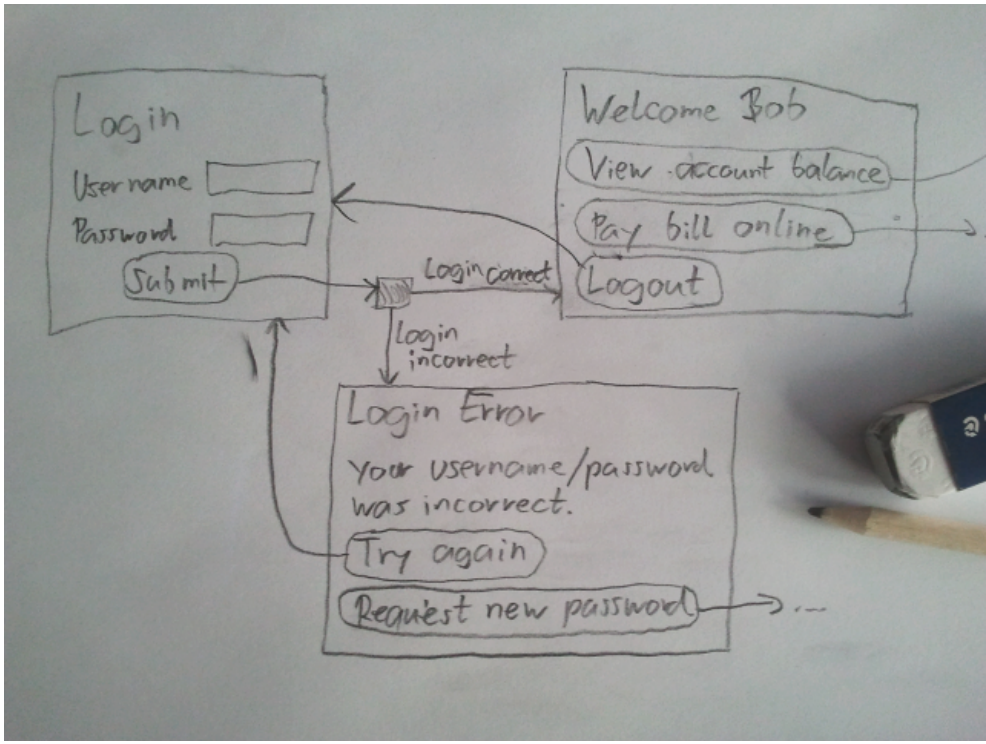
Usually many different models conceivable; different models for different purposes

Screen Diagrams

Idea: Get UI right through early user feedback
-> Use models to discuss UI with users

Screen diagrams are a simple informal model for UIs

1. Draw **prototypical screens** of a system which look like real screens, with "real" data (graphical details not important)
2. Draw **arrows** from the controls of a screen to the screens that follow when the control is used (e.g. button click)
3. If multiple screens are connected to same control, insert black square signifying **conditional branch**



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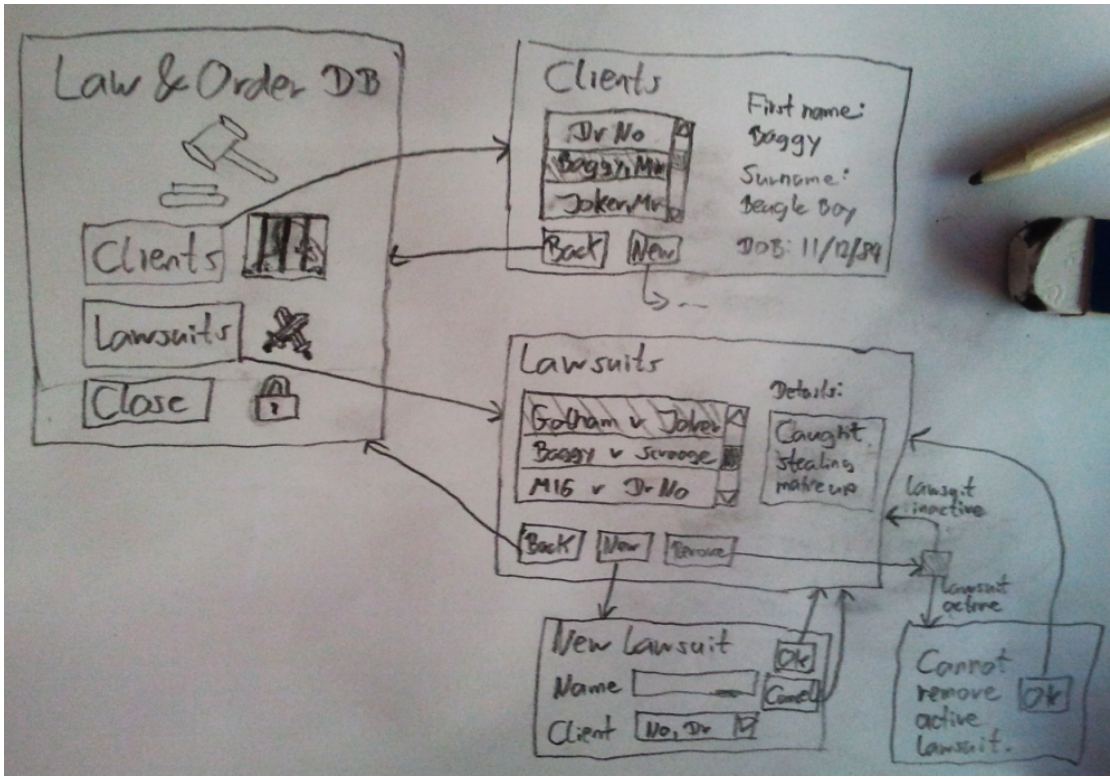
Screen Diagram Example

Create a click dummy for the following system:
A lawyer needs a program to manage clients and lawsuits. When she opens the program, she wants to see a menu with functions for listing all clients, listing all lawsuits, and closing the program. The screen that lists all the clients has a function for showing the details of a client and a function for going back to the main menu. Similarly, the screen that lists the lawsuits has a function for showing the details of a lawsuit and a function for going back.



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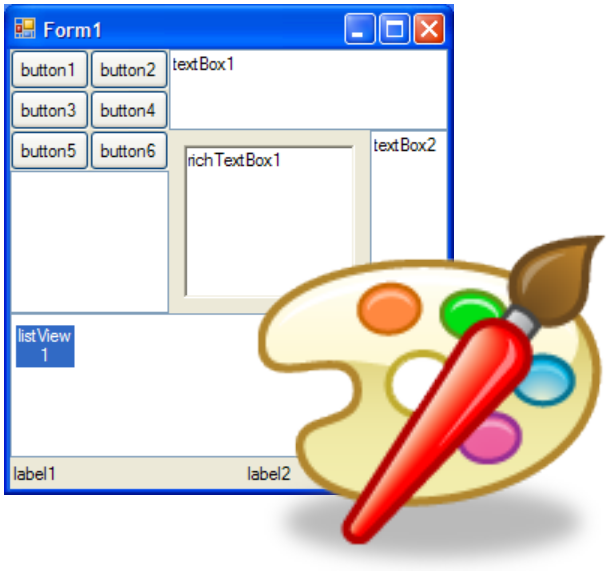
GUI Builders: WindowBuilder for Eclipse



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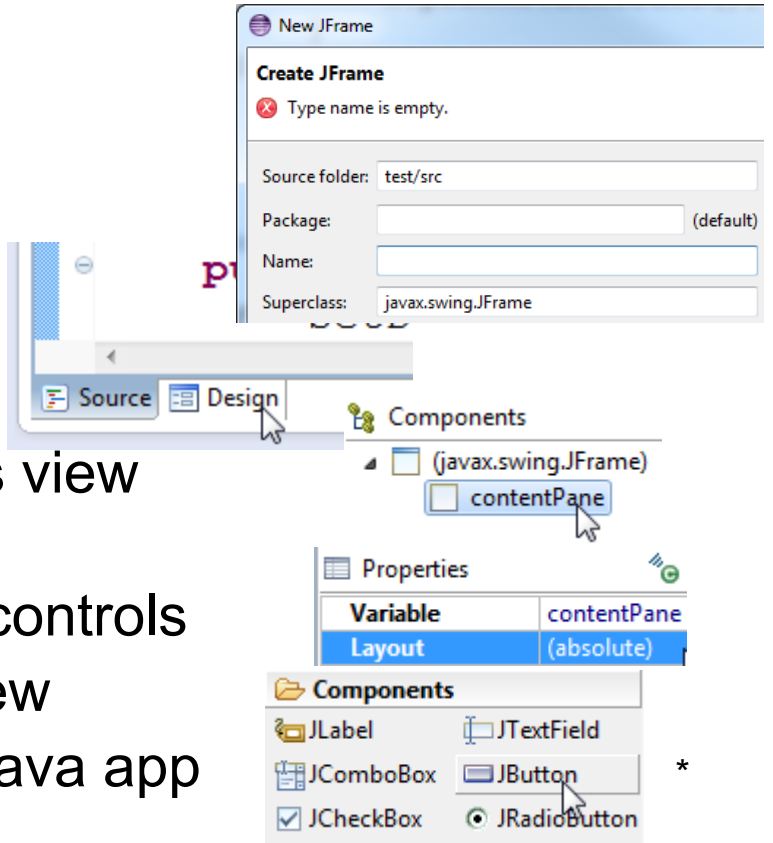
Creating a JFrame

1. Install WindowBuilder with Help -> “Install New Software” using the “update site” link for your Eclipse version from here: http://www.eclipse.org/windowbuilder/download.php (select all of “Swing Designer” and “WindowBuilder Engine” except the “WindowBuilder XML Core”)
2. Add a “JFrame” to your project using New -> Other -> WindowBuilder -> Swing Designer -> JFrame
3. Choose a package and class name
4. Switch between code and UI using the tabs at the bottom of the editor
5. Select “contentPane” in Components view
6. In Properties view: set the Layout to “(absolute)” to allow free placement of controls
7. Add components from the Palette view
8. Run the application using “Run” as Java app



WindowBuilder User Interface

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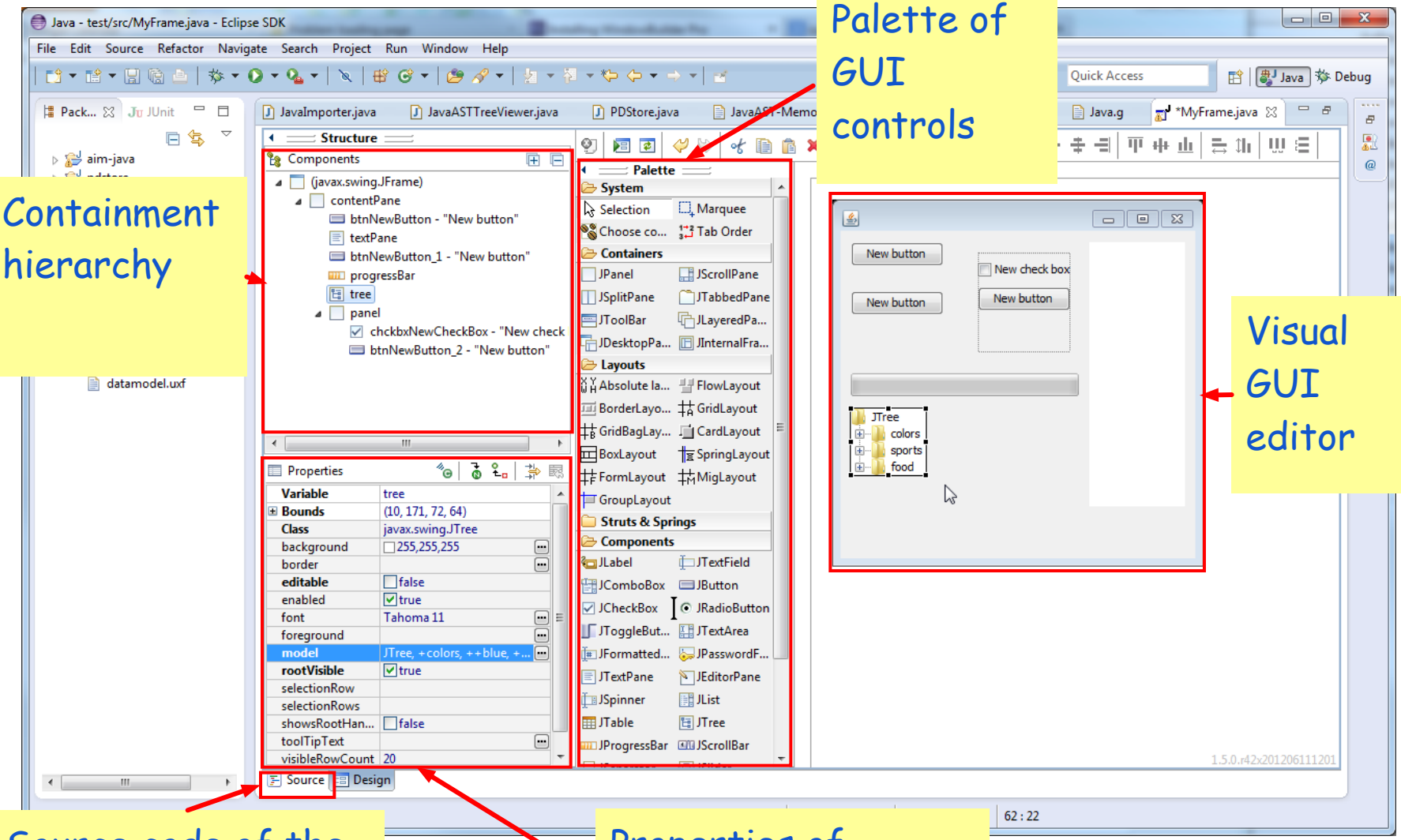

Palette of GUI controls

Containment hierarchy

Visual GUI editor

Source code of the GUI

Properties of selected control

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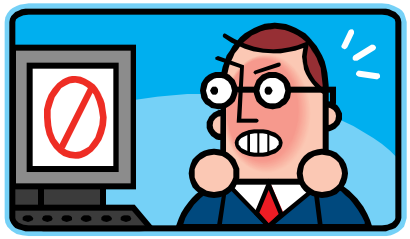
User Interface Prototypes ("Click Dummies")



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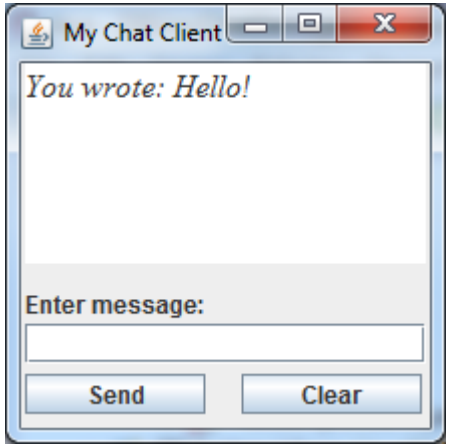
Click Dummies

Idea: bring screen diagrams to life with
UI mockups / UI prototypes / "click dummies"

- The user can **navigate** between the screens
- The user can see how **input & output** is done by the system
- The user can **imagine** the real system



Very restricted but very easy to create

- **No functionality** implemented
- Only **hypothetical (fake) data** in the UI
- Very good for early **user testing & feedback**!!!

Opening and Closing Frames on Button Click

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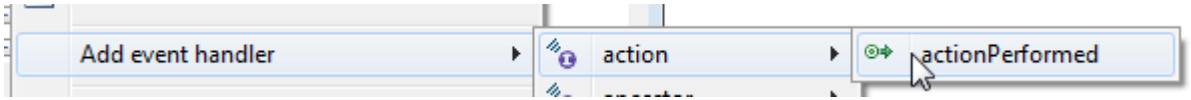
Add event handler by right-clicking on component and using menu



Code for opening new frame ("FrameB"):

```
final JFrame frameB = new FrameB();
btnOpenFrameB.addActionListener(new ActionListener() {
    public void actionPerformed(ActionEvent arg0) {
        frameB.setVisible(true);
}});
```

Code for closing the current frame:

```
final JFrame frameA = this;
    btnClose.addActionListener(new ActionListener() {
        public void actionPerformed(ActionEvent e) {
            frameA.setVisible(false);
    }});
```

Summary

- **Models** try to represent interesting aspects of a system in a clear and manageable way
- **Screen diagrams** illustrate the UI of a system
- **GUI builders** help to create UIs quickly
- **UI prototypes** (“click dummies”) can be used for early user feedback

References:

http://www.paperprototyping.com/
http://www.eclipse.org/windowbuilder/

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Quiz

1. Describe a situation where using a model would be useful, and explain why (give 3 reasons).

2. Create a screen diagram for a simple media player app.

3. What is a click dummy? What is it used for?