Research Overview

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Outline

• Software Engineering Research
• Applications of Statistical Learning
• Software Engineering Projects
Software Engineering Research

• **Code analysis** for developer productivity
  – **CnP**: Copy and Paste Support
  – **BCC**: Better Code Completion
  – **CriticAL**: a Critic for API’s and Libraries

• Interested in applying **code analysis** to solve **security** problems (e.g., malware detection, security vulnerability detection, intrusion detection)
CnP: Copy, Paste, and Modify

- Better quality and faster development by leveraging regularity within code clones
BCC: Better Code Completion

- Current Code Completion, alphabetical
BCC: Better Code Completion

- Current Code Completion
- Type-based sorting
BCC: Better Code Completion

• Current Code Completion
• Type-based sorting
• Use-count-based sorting
CriticAL: Critic for APIs and Libraries
CriticAL: Critic for APIs and Libraries

The JFrame you have created at [test.Test:6] has not been configured properly for display. A JFrame can be displayed by calling the setVisible(true) method on the frame object.
CriticAL: Critic for APIs and Libraries

The JFrame created in your code at [test.Test:6] does not contain any components. Please see the associated document to learn about adding new components to the frame.
CriticAL: **Critic** for **APIs** and **Libraries**

How to Use JFrame

I see you are using a JFrame in your code [Take Me There]. However, you have not yet configured it properly. Here are few important steps that you should consider while using JFrame:

1. Initialize the frame, possibly with a title.
2. Get hold of its content pane to add new components.
3. Decide if the default layout manager (BorderLayout) of the JFrame is suitable for your needs. If not, choose another layout manager and set it to the content pane.
4. Add components to the content pane.
5. Use pack() to compute the size of the frame.
6. Set the default close operation behavior.
7. Set the frame visible.

The following code snippet shows these steps:

```java
public class Test {
    public static void main(String[] args) throws Exception {
        // Step 1: Create a JFrame with a title
        JFrame frame = new JFrame("Test Application");
        // Step 2: Get hold of the content pane, which is a JPanel object
        JPanel panel = (JPanel)frame.getContentPane();
    }
}
```
Software Engineering Research

• **Code analysis** for developer productivity
  – **CnP:** Copy and Paste Support
  – **BCC:** Better Code Completion
  – **CriticAL:** a Critic for API and Libraries

• Interested in applications in **security** (e.g., malware detection, security vulnerability detection)
Applications of Statistical Learning

• Automated classifications of online discussions of programming problems into topics
  – may result in better technical support
  – Cyber-security???

• Keystroke analysis as a means to continuously authenticate a computer user, after they are logged in (complementing password/user id)
Classification of online discussions

• Categorize Java Swing newsgroup discussions
  – currently 8 categories of Swing-specific problems
• Nearly 1,000 manually labeled discussions
• ~94% accuracy using a Naïve Bayes classifier
Classification of online discussions

Forum: Swing

<table>
<thead>
<tr>
<th>Thread</th>
<th>Author</th>
<th>Replies</th>
<th>Last Post</th>
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</thead>
<tbody>
<tr>
<td>COMING SOON, the NEW Java Magazine!</td>
<td>ckildah</td>
<td></td>
<td>Jun 23, 2011 11:25 AM</td>
</tr>
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<td>How to post code</td>
<td>PhHein</td>
<td></td>
<td>Jun 23, 2011 11:13 AM</td>
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<td>JTree and JTable</td>
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<td>2</td>
<td>Jun 23, 2011 11:25 AM</td>
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<tr>
<td>JList single click multiple selection</td>
<td>806066</td>
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<td>Jun 23, 2011 11:23 AM</td>
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<tr>
<td>Deadlock in gui code</td>
<td>Boomah</td>
<td>2</td>
<td>Jun 23, 2011 11:23 AM</td>
</tr>
<tr>
<td>TableCellRenderer Problem</td>
<td>Avi Abrami</td>
<td>4</td>
<td>Jun 23, 2011 11:11 AM</td>
</tr>
<tr>
<td>Can't create nested subclass object</td>
<td>Wildbill</td>
<td>2</td>
<td>Jun 22, 2011 3:09 PM</td>
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<tr>
<td>Paint divider in JSplitpane</td>
<td>EdChouaffe</td>
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<td>Jun 22, 2011 4:26 AM</td>
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<td>hiding/showing dialog without affecting modality</td>
<td>894306</td>
<td>3</td>
<td>Jun 21, 2011 8:38 AM</td>
</tr>
<tr>
<td>Line between two label</td>
<td>user10586521</td>
<td>7</td>
<td>Jun 21, 2011 2:05 AM</td>
</tr>
<tr>
<td>calling repaint() isn't working</td>
<td>anIdiot</td>
<td>10</td>
<td>Jun 20, 2011 6:01 AM</td>
</tr>
</tbody>
</table>

Top Users in Forum
- camiek (775)
- Walter Laan (625)
- Darryl Burke (540)
- Kleopatra (345)
- jduprez (285)
- Stanslaw (220)
- aterai (170)
- Andrew Thompson (135)
- mKorbel (110)
- splungebob (100)

Popular Discussions
- Deadlock in gui code
  Replies: 2
  Last Post By: Boomah
  Last Post At: Jun 23, 2011 6:23 AM
Where do you add the children? I, let it to the panel?

I'm sure I'm missing something significant here because of lack of experience. If someone could help me out, I would be very appreciative.

There misses at least:

```java
first.add(this);
second.add(second);
```

Let us know.

Ed

Edited by edger on Jan 19, 2010 10:47 PM

Re: Creating Custom Layout

Posted: Jan 19, 2010 10:42 PM, by edger

If all you care about is being able to place specific components at specific points, then I think it’d just be easier using a `null` layout (`nulllayout`). Then on each:

```java
edger modals:
```

This what I tried up doing. I wanted a coordinate-based layout that allowed overlapping, but I wanted it to be scalable (they’re a null layout problems:

Ed

Edited by edger on Jan 19, 2010 10:43 PM

Re: Creating Custom Layout

Posted: Jan 19, 2010 10:47 PM, in response to: edger

```java
if (all care about is being able to place specific components at specific points, you think it’d just be easier using a null layout (nulllayout) ...
```

Ed

```
null layout is never necessary. Edger! (http://forums.sun.com/thread.jspa?threadID=511066)
```

Re: Creating Custom Layout

Posted: Jan 20, 2010 9:23 PM, in response to: edger

```java
where do you add the children? I, let it to the panel?
```

I'm sure I'm missing something significant here because of lack of experience. If someone could help me out, I would be very appreciative.

There misses at least:

```java
first.add(this);
second.add(second);
```

```
Waaa... i think i missed that... My motivation for doing this was the amazing roadmap i went through while doing a large project (ala Project: The Effect) and *** (put<typename>)* methods, so I know where them when i attempted this. VERY obvious now...
```

Works:

```java
import java.awt.LayoutManager;
import java.awt.Container;
import java.awt.LayoutManager;
import javax.swing.SpringLayout;
import java.awt.LayoutManager;
import javax.swing.SpringLayout;
public class CoordinateLayout implements SpringLayout {
```

https://forums.oracle.com/forums/thread.jspa?messageID=5698221
Software Engineering Projects

• One cannot do software engineering research without practicing!

• Commercial projects (Feasibility exploration and prototyping)
  – My group has more than 5 grad/undergrad any given year
  – As research, or course projects

• Expertise areas
  – Web-/desktop-based information systems
  – GUI/usability design
  – Numerical and other algorithms
  – Testing/maintaining systems
  – Developer tools ...

• Company Benefits
  – Low cost, low risk, service of experienced professor and a grad
  – Able to evolve the system with the customer
Summary

• **Software Engineering Research**
  – Code analysis for cyber-security (e.g., malware detection, security vulnerability detection)

• **Applications of Statistical Learning**

• **Software Engineering Projects**

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Home page: [http://people.clarkson.edu/~dhou](http://people.clarkson.edu/~dhou)

Research group: [http://serl.clarkson.edu](http://serl.clarkson.edu)