

Research Overview

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Outline

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

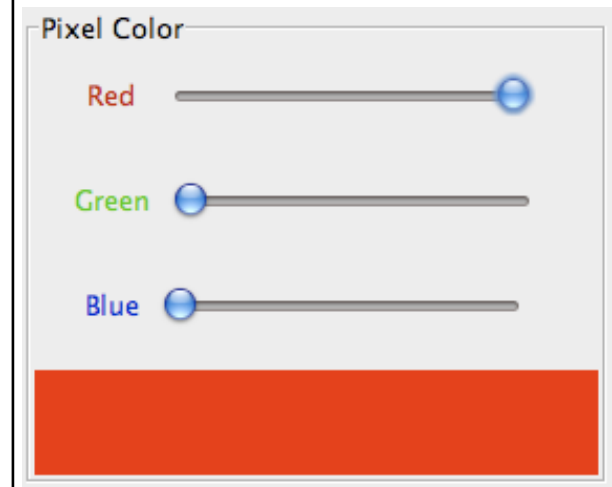
Software Engineering Research

- **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

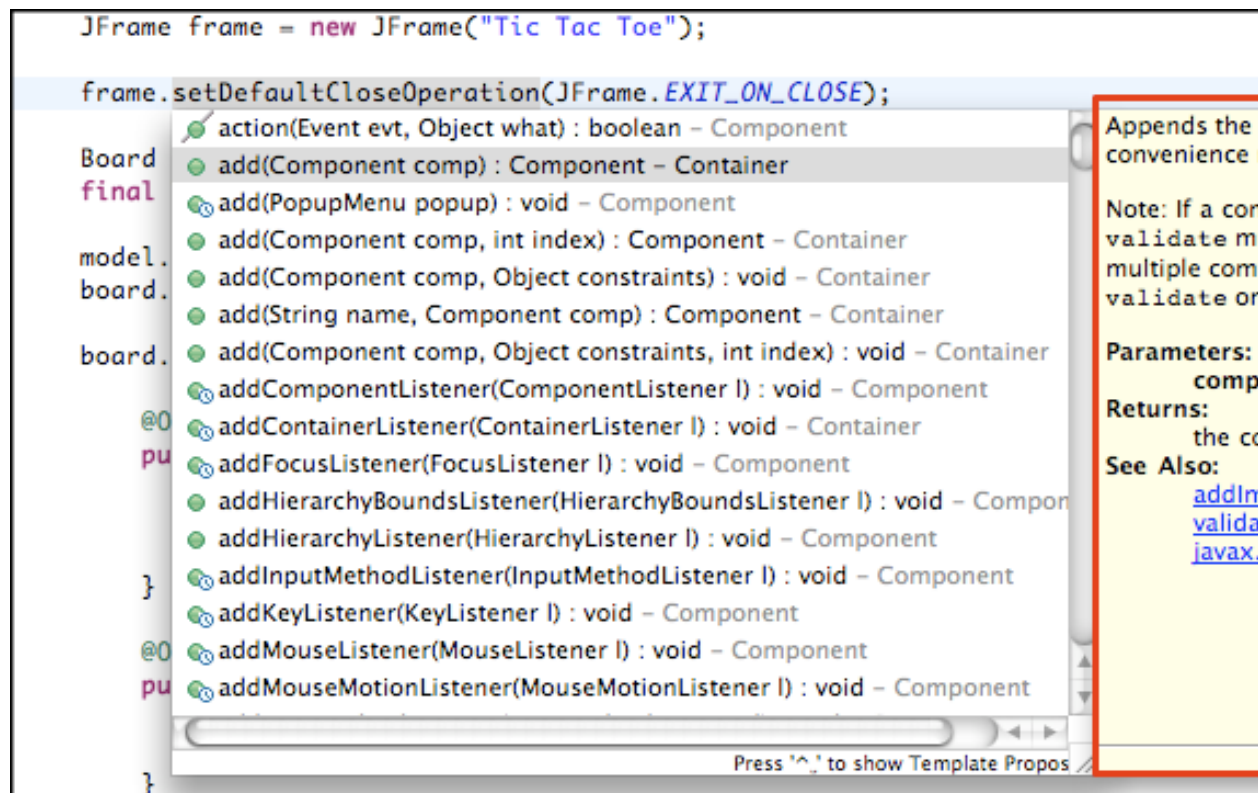
- Better quality and faster development by leveraging *regularity* within code clones

```
115
116 rPanel = new JPanel(new FlowLayout());
117 rPanel.setOpaque(false);
118 rPanel.add(new JLabel("Red"));
119 rSlider = new JSlider(0, 255, 0);
120 rSlider.setOpaque(false);
121 rSlider.addChangeListener(colorChangeListener);
122 rPanel.add(rSlider);
123
124 gPanel = new JPanel(new FlowLayout());
125 gPanel.setOpaque(false);
126 gPanel.add(new JLabel("Red"));
127 gSlider = new JSlider(0, 255, 0);
128 gSlider.setOpaque(false);
129 gSlider.addChangeListener(colorChangeListener);
130 gPanel.add(gSlider);
131
```



BCC: Better Code Completion

- Current Code Completion, alphabetical



```
JFrame frame = new JFrame("Tic Tac Toe");
frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
```

Board
final
model.
board.
board.
@0
pu
@0
pu

- action(Event evt, Object what) : boolean - Component
- add(Component comp) : Component - Container
- add(PopupMenu popup) : void - Component
- add(Component comp, int index) : Component - Container
- add(Component comp, Object constraints) : void - Container
- add(String name, Component comp) : Component - Container
- add(Component comp, Object constraints, int index) : void - Container
- addComponentListener(ComponentListener l) : void - Component
- addContainerListener(ContainerListener l) : void - Container
- addFocusListener(FocusListener l) : void - Component
- addHierarchyBoundsListener(HierarchyBoundsListener l) : void - Component
- addHierarchyListener(HierarchyListener l) : void - Component
- addInputMethodListener(InputMethodListener l) : void - Component
- addKeyListener(KeyListener l) : void - Component
- addMouseListener(MouseListener l) : void - Component
- addMouseMotionListener(MouseMotionListener l) : void - Component

Append the :
convenience r

Note: If a com
validate mu
multiple comp
validate on

Parameters:
comp

Returns:
the co

See Also:
[addIm](#)
[validat](#)
[javax.s](#)

Press '^.' to show Template Propos

BCC: Better Code Completion

- Current Code Completion
- Type-based sorting

```
JButton reset = new JButton("Reset");
reset.addActionListener(new ActionListener(){
    ● getAccessibleContext() : AccessibleContext - JButton
    ● isDefaultButton() : boolean - JButton
    ● isDefaultCapable() : boolean - JButton
    ● setDefaultCapable(boolean defaultCapable) : void - JButton
    ● addActionListener(ActionListener l) : void - AbstractButton
    ● addChangeListener(ChangeListener l) : void - AbstractButton
    ● addItemListener(ItemListener l) : void - AbstractButton
    ● doClick() : void - AbstractButton
    ● doClick(int pressTime) : void - AbstractButton
    ● getAction() : Action - AbstractButton
    ● getActionCommand() : String - AbstractButton
    ● getActionListeners() : ActionListener[] - AbstractButton
    ● getChangeListeners() : ChangeListener[] - AbstractButton
    ● getDisabledIcon() : Icon - AbstractButton
    ● getDisabledSelectedIcon() : Icon - AbstractButton
    ● getDisplayedMnemonicIndex() : int - AbstractButton
    ● getHideActionText() : boolean - AbstractButton
    ● getHorizontalAlignment() : int - AbstractButton
    ● getHorizontalTextPosition() : int - AbstractButton
}
```

```
JFrame frame = new JFrame("Tic Tac Toe");
frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
frame.addActionListener(new ActionListener(){
    ● add(Component comp) : Component - Container
    ● add(PopUpMenu popup) : void - Component
    ● add(Component comp, int index) : Component - Container
    ● add(Component comp, Object constraints) : void - Container
    ● add(String name, Component comp) : Component - Container
    ● add(Component comp, Object constraints, int index) : void - Container
    ● add(ComponentListener(ComponentListener l)) : void - Component
    ● add(ContainerListener(ContainerListener l)) : void - Container
    ● addFocusListener(FocusListener l) : void - Component
    ● add(HierarchyBoundsListener(HierarchyBoundsListener l)) : void - Component
    ● add(HierarchyListener(HierarchyListener l)) : void - Component
    ● add(InputMethodListener(InputMethodListener l)) : void - Component
    ● addKeyListener(KeyListener l) : void - Component
    ● addMouseListener(MouseListener l) : void - Component
    ● add(MouseMotionListener(MouseMotionListener l)) : void - Component
}
```

BCC: Better Code Completion

- Current Code Completion
- Type-based sorting
- Use-count-based sorting

```
JButton reset = new JButton("Reset");
reset.addActionListener(new ActionListener() {
    add(Component comp, Object constraints) : void - Container
    addActionListener(ActionListener l) : void - AbstractButton
    getAccessibleContext() : AccessibleContext - JButton
    isDefaultButton() : boolean - JButton
    isDefaultCapable() : boolean - JButton
    setDefaultCapable(boolean defaultCapable) : void - JButton
    addChangeListener(ChangeListener l) : void - AbstractButton
    addItemListener(ItemListener l) : void - AbstractButton
    doClick() : void - AbstractButton
    doClick(int pressTime) : void - AbstractButton
    getAction() : Action - AbstractButton
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    getHideActionText() : boolean - AbstractButton
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```

```
JFrame frame = new JFrame("Tic Tac Toe");
frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
frame.addActionListener(new ActionListener() {
    addActionListener(ActionListener l) : void - AbstractButton
    getAccessibleContext() : AccessibleContext - JButton
    isDefaultButton() : boolean - JButton
    isDefaultCapable() : boolean - JButton
    setDefaultCapable(boolean defaultCapable) : void - JButton
    addActionListener(ActionListener l) : void - AbstractButton
    addChangeListener(ChangeListener l) : void - AbstractButton
    addItemListener(ItemListener l) : void - AbstractButton
    doClick() : void - AbstractButton
    doClick(int pressTime) : void - AbstractButton
    getAction() : Action - AbstractButton
    getActionCommand() : String - AbstractButton
    getActionListeners() : ActionListener[] - AbstractButton
    getChangeListeners() : ChangeListener[] - AbstractButton
    getDisabledIcon() : Icon - AbstractButton
    getDisabledSelectedIcon() : Icon - AbstractButton
    getDisplayedMnemonicIndex() : int - AbstractButton
    getHideActionText() : boolean - AbstractButton
    getHorizontalAlignment() : int - AbstractButton
    getHorizontalTextPosition() : int - AbstractButton
```

CriticAL: Critic for APIs and Libraries

Test.java CriticAL's Help Button

```
4 public class Test {
5     public static void main(String args) {
6         JFrame frame = new JFrame();
7         frame.setTitle("A Test");
8     }
9 }
```

Markers for Critics List View for Critics

@ Javadoc CriticAL Analysis Report Markers

4 items

| Description | Location | Type |
|---------------------------|----------|----------------|
| Did you know that the ... | line 6 | Explanation |
| The default close oper... | line 6 | Recommendation |
| The JFrame created in ... | line 6 | Recommendation |
| The JFrame you have c... | line 6 | Criticism |

CriticAL: Critic for APIs and Libraries

The screenshot shows an IDE window titled "Test.java" with a toolbar at the top. The code editor displays the following code:

```
4 public class Test {  
5     public static void main(String args) {
```

A context menu is open over a lightbulb icon in the left margin. The menu items are:

- Toggle Breakpoint
- Toggle Breakpoint Enablement
- Go to Annotation ⌘1
- Critics** (highlighted) ▶
 - Criticism #1** (highlighted)
 - Explanation #1
 - Recommendation #1
 - Recommendation #2
- Add Bookmark...
- Add Task...
- ✓ Show Quick Diff ^⇧Q
- ✓ Show Line Numbers

A yellow tooltip box on the right contains the following text:

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.

At the bottom of the IDE, a table shows the following entries:

| | | |
|---------------------------|--------|----------------|
| The JFrame created in ... | line 6 | Recommendation |
| The JFrame you have c... | line 6 | Criticism |

CriticAL: Critic for APIs and Libraries

The screenshot shows an IDE window titled "Test.java" with a "CriticAL's Help Button" in the top right corner. The code snippet is:

```
4 public class Test {  
5     public static void main(String args) {
```

A red box highlights the CriticAL interface. It includes a list of items:

- Criticism #1
- Explanation #1
- Recommendation #1 (highlighted)
- Recommendation #2

A yellow tooltip box contains the text: "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."

Below the list is a table with 4 items:

| Description | Location | Type |
|---------------------------|----------|----------------|
| Did you know that the ... | line 6 | Explanation |
| The default close oper... | line 6 | Recommendation |
| The JFrame created in ... | line 6 | Recommendation |
| The JFrame you have c... | line 6 | Criticism |

CriticAL: Critic for APIs and Libraries

The screenshot shows an IDE window with a file named 'Test.java'. A CriticAL analysis report is overlaid on the code, titled 'How to Use JFrame'. The report contains the following text:

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 a `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:

```
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();  
    }  
}
```

The IDE interface also shows a toolbar with various icons, a 'CriticAL's Help Button' label, and a 'CriticAL Analysis Report' tab. A red box highlights the report content, and a blue arrow points to a lightbulb icon in the toolbar.

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

[Post New Thread](#)
[← Back to Category](#)

Messages: 210,011 - Threads: 46,652 - Filter:
 Pages: 3,111 [[1](#) [2](#) [3](#) [4](#) [5](#) | [Next](#)]

| | Thread | Author | Replies | Last Post |
|--|---|------------------------------|---------|--|
| | COMING SOON, the NEW Java Magazine! Posted By: dkildahl -- Jun 8, 2011 11:55 AM | | | |
| | How to post code Posted By: PhHein -- Feb 18, 2011 3:30 AM | | | |
| | JTree and JTable | 868031 | 2 | Jun 23, 2011 11:25 AM Last Post By: 868031 » |
| | JList single click multiple selection | 806066 | 2 | Jun 23, 2011 11:13 AM Last Post By: DrClap » |
| | Deadlock in qui code | Boomah | 2 | Jun 23, 2011 6:23 AM Last Post By: Boomah » |
| | TableCellRenderer Problem | Avi Abrami | 4 | Jun 23, 2011 3:11 AM Last Post By: Avi Abrami » |
| | Can't create nested subclass object | Wildbill | 2 | Jun 22, 2011 3:09 PM Last Post By: jduprez » |
| | Paint divider in JSplitpane | EdChouaffe | 4 | Jun 22, 2011 4:26 AM Last Post By: EdChouaffe » |
| | hiding/showing dialog without affecting modailty | 834306 | 3 | Jun 21, 2011 8:38 AM Last Post By: Walter Laan » |
| | Line between two label | user10586521 | 7 | Jun 21, 2011 2:05 AM Last Post By: Darryl Burke » |
| | calling repaint() isnt working | anIdiot | 10 | Jun 20, 2011 6:01 AM Last Post By: anIdiot » |

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- [Walter Laan](#) (625)
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- [jduprez](#) (285)
- [StanislavL](#) (220)
- [aterai](#) (170)
- [Andrew Thompson](#) (135)
- [mKorbel](#) (110)
- [splungebob](#) (100)

Popular Discussions

- [Deadlock in qui code](#)
Replies : 2
Last Post By: [Boomah](#)
Last Post At: Jun 23, 2011 6:23 AM

Classification

Where do you add the children l1, b1, 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:

```
first.add(l1);
first.add(b1);
```

Let us know.
J.

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

layout

bogdana
Posts: 148
Registered: 09/07/10

Re: Creating Custom Layout
Posted: Jan 19, 2010 5:42 PM in response to: [840804](#)

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 (setLayout(null)). Then on each co

But that's all it'll do. It won't check for any collisions/overlapping components and won't automatically move them if the container gets resized, so it'd be possible to t

negative point, or a point bigger than the container. You could however, create your own layout and only fill out the necessary methods from implementing LayoutM

This is what I ended up doing since I wanted a coordinate-based layout that allowed overlapping, but I wanted it to be scrolling friendly (btw, a null layout's preferre

Edited by: bogdana on Jan 19, 2010 5:43 PM
Edited to emphasize LayoutManger2 if creating your own layout. The Container.add(Component, Object) method (i.e. myJPanel.add(label,new Point(x,y)) will pass th

Andrew Thompson
Posts: 7,649
Registered: 08/24/10

Re: Creating Custom Layout
Posted: Jan 19, 2010 6:07 PM in response to: [bogdana](#)

bogdana wrote:
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 (setLayout(null)). ...

Blech.. [setLayout(null) is never necessary. Ever!]<http://forums.sun.com/thread.jspa?threadID=5411066>

840804
Posts: 50,000
Registered: 03/01/11

Re: Creating Custom Layout
Posted: Jan 19, 2010 6:23 PM in response to: [jduprez](#)

Where do you add the children l1, b1, 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:

```
first.add(l1);
first.add(b1);
```

Wow... I cant believe I missed that... My motivation for doing this was the annoying redundancy I went through while doing a large project (aka: Project Badass). Af

*** putConstraint() methods, so I overlooked them when I attempted this. VERY obvious now...

Works:

```
import javax.swing.SpringLayout;
import java.awt.Container;
import java.awt.Component;

public class CoordinateLayout extends SpringLayout
{
    Container cont;

    public CoordinateLayout(Container ct)
    {
        super();
        cont = ct;
    }

    public void addComponent(Component comp, int x, int y)
    {
        //Added this to stop that pain-in-the-*** REDUNDANCY
        cont.add(comp);
    }
}
```


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>

Research group: <http://serl.clarkson.edu>