Breaking the Barriers to Successful Refactoring:

Observations and Tools for Extract Method

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Problems in Today's Tools

• Not intuitive to use
• Select code, try to refactor, get error messages, also known as "wizard-and-error"
• Communicate violated preconditions
Opdyke's Preconditions

• The selected code must be a list of statements
• Within the selection, there must be...
  • ...no assignments to variables that might be used later in the flow of execution
  • ...no conditional returns
  • ...no branches to code outside of the selection
Solution!

- Help in selecting statements
- Give user early information about problems
Selection Assist

- Colors related statements

```java
boolean isWellDressed()
{
    if(jersey.isSpandex()){
      return shorts.isSpandex();
    }
    return true;
}
```
Box View

- Represents code statements as boxes
- Abstracts from code formatting

```java
void fixWheel(boolean isFront){
    boolean fixed;
    if(isFront){
        fixed = fix(frontWheel);
    } else {
        fixed = fix(backWheel);
    }
    if(!fixed)
        callShop();
}```
Refactoring Annotations

- Gives visual hints about violated preconditions
- Complexity metric

- Demo
Results

- 16 students participated
- Most of them had 5 years of programming experience
- They performed well with the new tools
## Results - Selecting If Statements

<table>
<thead>
<tr>
<th></th>
<th>Mis-Selected</th>
<th>Correctly Selected</th>
<th>Mean Selection Time [s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouse / Keyboard</td>
<td>37</td>
<td>303</td>
<td>10.2</td>
</tr>
<tr>
<td>Selection Assist</td>
<td>6</td>
<td>355</td>
<td>5.5</td>
</tr>
<tr>
<td>Box View</td>
<td>2</td>
<td>357</td>
<td>7.8</td>
</tr>
</tbody>
</table>
## Results - Handling Problems

<table>
<thead>
<tr>
<th></th>
<th>Missed Violations</th>
<th>Irrelevant Code</th>
<th>Mean Identification Time [s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eclipse Wizard</td>
<td>11</td>
<td>28</td>
<td>164</td>
</tr>
<tr>
<td>Refactoring Annotations</td>
<td>1</td>
<td>6</td>
<td>46</td>
</tr>
</tbody>
</table>
Conclusion

- Very important topic
- Guidelines not verified and possible to change
- Buggy tools...
- ... but not main goal, but rather contribution for further studies
Questions and Comments?
Backup - Guidelines

- Code Selection
  - Lightweight, no overhead
  - Overcome unfamiliar or unusual code formatting

- Display Violated Preconditions
  - Quickly understand the error
  - Indicate location of the error
  - All violations should be visible at once
  - Indication about amount of work to fix violation
Backup - Used Codebase

- Azureus, a peer-to-peer file-sharing client
- GanttProject, a project scheduling application
- JasperReports, a report generation library
- Jython, a Java implementation of the Python programming language
- Java 1.4.2 libraries