A Fault Detection Framework for Comparing Test Suite Reduction Techniques

http://www.cis.udel.edu/~hipster

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The Fault Detection Comparison Subproject
- Need to compare test suite reduction techniques
- "Best" Reduced suite detects most faults
- Comparison Methodology
  - Seed faults in working application
  - Compare quantity/types of faults detected by each reduced suite

The Larger Project View
- Goal: Testing Web Applications for Correctness
- Problem: Expensive to replay all test cases
- Solution: Reduce number of test cases in test suite
- Several proposed reduction techniques

Challenge: Create a framework to automatically find faults detected by a test suite

Fault Seeding
- Inject faults into working application

Types of Seeded Faults
- Scripting: change control flow
- Web page: change HTML, name-value pairs
- Database: modify queries, DB structure

<table>
<thead>
<tr>
<th>Type of Fault</th>
<th>Bookstore</th>
<th>Scheduler</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scripting</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>Web page</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>Database</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

Achieving Accuracy in Oracle for User-Session-Based Testing
- External data to application
- Time expressions
- Random display order, content same

User-Session-Based Testing
- Test Suite: set of test cases
- Test Case: sequence of URLs + name-value pairs

Example: http://www.MyApplication.com/Login.jsp?Login=emily&FormAction=login&password=gibson

Experimental Fault Detection Framework

Faults
Fault Seeder
Faulty Web Applications
Faulty Application
Oracle
Fault Detection Report

Replay Tool

Original Application
Test Cases (URLs)
Replay
- Send each URL in test case to web application
- Download HTML output of application
- Compare output with Oracle

Oracle
- Non-faulty version of web application
- Intelligent Diff of output
- Output differs → test case detected fault

1 For details, see Sara Sprenkle's poster, “An Empirical Comparison of Test Suite Reduction Techniques for User-session-based Testing of Web Applications"