Applying Concept Analysis to User-session-based Testing of Web Applications
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User-session-based Testing
A user session is a sequence of URLs and name-value pairs.
user session (i.e., IP address) = <url1, url2, url3, url4, url5>

Web Applications
Client (HTML)
Server (Java)
Database (MySql)
Front End Back End

Example User Session
register.jsp?name=sree&pass=phd
shop.jsp?book_id=1&book_cat=java

Problem:
Reduce cost of maintaining and executing large test suites of user sessions

Approach:
• Cluster user sessions by concept analysis
• Select user sessions from clusters
• Reduce test suite on-the-fly
• Automate the testing process

Target Criterion
Cover all URLs of application while maintaining use case representation

Reduction Heuristics
- 1-lim: bottom node and next-to-bottom nodes. In this example: {us2, us3}
- 1-per: each node from bottom to top. In this example: {us2, us3, us1, us4}
- k-lim: each node from bottom to k-levels. In this example: k= 3, {us3, us2, us1, us4}

Input: User session data
A user session is a sequence of URLs and name-value pairs.

Output: Concept Lattice
Each node is a concept = (Oi, Aj) where Oi={us1…, us i} and Aj ={a1,…, a j} and all Oi have all Aj in common and vice versa
Lattice shows partial order of concepts

Relation Table:
<table>
<thead>
<tr>
<th>Objects (User Sessions)</th>
<th>GD</th>
<th>GR</th>
<th>GL</th>
<th>PL</th>
<th>GS</th>
</tr>
</thead>
<tbody>
<tr>
<td>us1</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>us2</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>us3</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>us4</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Experimental Evaluation

Reduced Test Suite Size
Program Coverage Loss
Fault Detection
Analysis Summary
- 1-lim creates the smallest suite but loses code coverage and faults
- 2-lim is more effective than 1-lim with small increase in suite size