Keeping Evolving Requirements and Acceptance Tests Consistent via Automatically Generated Guidance

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Agenda

1. Context and Background
2. Motivation
3. GuideGen Overview
4. Evaluation
5. Future work and summary
"We need to discover, understand, formulate, analyze and agree on what problem should be solved, why such a problem needs to be solved and who should be involved in responsibility of solving that problem."

– Axel van Lamsweerde

"Requirements engineering refers to the process of defining, analyzing, documenting, validating and maintaining software requirements."

– G. Katonya and I. Sommerville
Acceptance testing is the process of comparing the program to its initial requirements and the current needs of its end users. – Glenford J. Myers
1. Context and Background

REQUIREMENTS

ACCEPTANCE TESTS
Motivation

Exploratory study with 15 companies in Europe, USA
2. Motivation

- Bugs for features
- Outdated, inconsistent tests
- Testers are not aware
- Requirements change
2. Motivation

Inconsistent documents

Poor communication

False expectations

=&gt;

COSTS

=&gt;

DELAY

=&gt;

=}
3. GuideGen Overview - Goals

When requirements evolve:

1. Support test engineers in making decisions on how to modify impacted acceptance tests.

2. Ensure on-time and smooth communication of changes between requirements and test engineers.

Generate guidance

Notification system
3. GuideGen Overview
3. GuideGen Overview

A user can add new users to the group. The addition of a new user must be first approved by the admin. The admin and the user can modify personal data and the status of that user. Only a user can modify its status. The admin must be logged-in in order to modify personal data of a user. This should be communicated to Tom.
4. Evaluation of GuideGen

1. Quantitative evaluation of correctness, completeness and clarity of the generated suggestions.

2. Qualitative evaluation of usefulness and applicability of GuideGen to real, industrial projects.
## Evaluation 1 – Study Design

<table>
<thead>
<tr>
<th>Dataset/Company</th>
<th>Type of requirements</th>
<th>Number of generated suggestions</th>
<th>Number of experts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS1/C1</td>
<td>User story</td>
<td>28</td>
<td>2</td>
</tr>
<tr>
<td>DS2/C2</td>
<td>User story</td>
<td>37</td>
<td>2</td>
</tr>
<tr>
<td>DS3/C3</td>
<td>Unstructured text</td>
<td>197</td>
<td>3</td>
</tr>
</tbody>
</table>
## Evaluation 1 - Results

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct actions</td>
<td>&gt; 80% (user stories), ±67% (unstructured)</td>
</tr>
<tr>
<td>Grammatically correct</td>
<td>&gt; 80% (DS1, DS3), 67.5% (DS2)</td>
</tr>
<tr>
<td>Complete</td>
<td>Almost all (&gt; 95%)</td>
</tr>
<tr>
<td>Understandable</td>
<td>Almost all (&gt; 95%)</td>
</tr>
<tr>
<td>Self-explanatory</td>
<td>± 73%</td>
</tr>
<tr>
<td>Redundant/Unnecessary</td>
<td>&lt; 10% (DS1, DS2), ± 30% (DS3)</td>
</tr>
<tr>
<td>Missing</td>
<td>&lt; 6%</td>
</tr>
</tbody>
</table>
Evaluation 2 – Study Design

QUALITATIVE EXPERIMENT

PRESENTATION

TOOL TRIAL

INTERVIEW
Evaluation 2 – study design

13 EXPERIMENT SESSIONS

23 PARTICIPANTS

10 COMPANIES

Serbia (4)  Switzerland (3)  The Netherlands (1)  Germany (1)  Denmark (1)
Evaluation 2 – Results (Usefulness)

Useful in general

Useful for their company
Evaluation 2 – Results (Applicability concerns)
Future work

- Improve GuideGen: implement a plugin or add missing features to increase usefulness and applicability.
- Identify first which documents are impacted before generating guidance on how to adapt them.
- Extend applicability to other types of document artifacts (e.g. requirements to source code, requirements to design... )
Summary

A user can add new users to the group. The addition of a new user must be first approved by the admin. The admin and the user can modify personal data and the status of that a user. Only user can modify its status. The admin must be logged in order to modify personal data of a user. This should be communicated to Tom.

www.guidegen.org
Thank you.
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