Final thesis

Automated testing in web applications

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February 10, 2014

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Abstract

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Acknowledgments

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1 Introduction

1.1 Background

During code refactoring or implementation of new features in software, errors often occur in existing parts. This may have a serious impact on the reliability of the system, thus jeopardizing user's confidence for the system. Automatic testing is utilized to verify the functionality of software in order to detect bugs and errors before they end up in a production environment.

Starting new web application companies often means rapid product development in order to create the product itself, while maintenance levels are low and the quality of the application is still easy to assure by manual testing. As the application and the number of users grows, maintenance and bug fixing becomes an increasing part of the development. The size of the application might make it implausible to test in a satisfying way by manual testing.

The commissioner body of this project, GOLI, is a startup company developing a web application for production planning called GOLI Kapacitetsplanering. Due to requirements from customers, the company wishes to extend the application to include new features for handling staff manning. The current system uses automatic testing to some extent, but these tests are cumbersome to write and takes long time to run. The purpose of the thesis is to analyze how this application can begin using tests in a good way whilst the application is still quite small. The goal is to determine a solid way of implementing new features and bug fixes in order for the product to be able to grow effortlessly.

1.2 Problem formulation

The goal of this final thesis is to analyze how automatic testing can be introduced in an existing web application in a good way, and if lower- level tests can be derived from existing high-level tests automatically. We will also study how this can be applied when extending the system with new features.

The main research questions of this project are the following:

- How can a combination of low-level and high-level testing be used when testing a web application?
- Is it possible to automatically derive lower-level unit tests from high-level behavioral tests?

1.3 Scope and limitations

There exists different categories of software testing, for example performance testing and security testing. The scope of this thesis is quality assurance testing[1], in which the purpose is to verify the functionality of a part of the system rather than measuring its characteristics. We will also only cover automatic testing, as opposed to manual testing where the execution and result evaluation of the test is done by a human. The term *testing* will hereby refer to automatic software quality assurance testing unless specified otherwise.

Since the result of this thesis will be evaluated in specific web application (i.e. GOLI Kapacitetsplanering), we will only cover techniques which are relevant this specific application. In other words, we will

focus on testing web applications which uses Ruby on Rails[2]and KnockoutJS[3].

[3]This is sometimes also called functional testing, but we will refrain from using that term since it has different meanings to different people.

[3]Ruby on Rails framework, urlhttp://rubyonrails.org/

[3]KnockoutJS framework, urlhttp://knockoutjs.com/

2 Methodology

The methodology for this thesis is based on the characteristics and guidelines proposed by Runeson and Höst [5]. An objective is defined, and a literature study is conducted in order to establish a theoretical base. The theory is evaluated by applying it in a real-life application context, and the result is analyzed in order to draw conclusions about the theory.

2.1 Literature study

The literature study was based on the problem formulation, and therefore focuses on web application testing overall and how it can be automated. In order to get a diverse and comprehensive view on these topics, multiple different kinds of sources were consulted. As a complement to a traditional literature study of peer-reviews articles and books, we chosen to also consider blogs and video recordings of conference talks.

While blogs are not either published nor peer-reviewed, they often express interesting thoughts and ideas, and may often give readers a chance to leave comments and discuss its contents. This might not qualify as a review for a scientific publication, but it also gives greater possibilities of leaving feedback on outdated information and is more open for discussion than traditional articles. Conference talks does have similar properties.

Blogs and conference talks does have another benefit over articles and books since they can be published instantly. The review- and publication process for articles is long and may take several months, and also might not be available in online databases until after their embargo period has passed [3, 6]. This makes it hard to present relevant and up-to-date on topics such as web development, where the most recent releases of well-used frameworks are less than a year old [4, 2, 1].

Sources are mainly relied upon recognized people in the open-source software community. Due to this, one might notice a skew towards to agile approaches and other often ideas often used in this community.

3 Theory

3.1 Test-driven development

TDD

3.2 Behavior-driven development

BDD

3.3 Quality factors for tests

Bibliography

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