Available online at www.sciencedirect.com

ScienceDirect

Electronic Notes in Theoretical Computer Science 314 (2015) 3–21

Electronic Notes in Theoretical Computer Science

www.elsevier.com/locate/entcs

Evaluating the Model-Based Testing Approach in the Context of Mobile Applications

Guilherme de Cleva Farto[1,2]

Universidade Tecnológica Federal do Paraná - UTFPR
Cornélio Procópio, Brasil

Fundação Educacional do Município de Assis - FEMA
Instituto Municipal de Ensino Superior de Assis - IMESA
Assis, Brasil

TOTVS Agroindústria
Assis, Brasil

Andre Takeshi Endo[3]

Universidade Tecnológica Federal do Paraná - UTFPR
Cornélio Procópio, Brasil

Abstract

The popularity of portable devices has grown rapidly in recent years. Due to the high number and diversity of users, new testing approaches are necessary to reduce the occurrence of faults and ensure better quality in mobile applications. The major objective of this paper is to evaluate the use of Model-Based Testing (MBT) in the construction and implementation of automated tests to verify and validate mobility solutions developed in the Google Android platform. The research proposal is guided by three questions: (Q1) – "Can the concepts of MBT be used in its current state to verify and validate functional requirements in mobile applications?"; (Q2) – "What are the results and challenges identified from adoption of MBT in mobile applications?"; and (Q3) – "How effective were the models and test cases generated, implemented and executed in the mobile application evaluated?". The results obtained from an experimental evaluation are discussed and related to questions of this research.

Keywords: automated testing, mobile applications, model-based testing, Android.

[1] The authors would like to thank TOTVS Agribusiness and its mobility cell by having collaborated with the development of this project. Special thanks to the Universidade Tecnológica Federal do Paraná (UTFPR – in Cornélio Procópio), Fundação Educacional do Município de Assis (FEMA), and Instituto Municipal de Ensino Superior de Assis (IMESA) for their support.

[2] Email: guilherme.farto@gmail.com

[3] Email: andreendo@utfpr.edu.br

http://dx.doi.org/10.1016/j.entcs.2015.05.002

1 Introduction

Currently, there has been a rapid growth in popularity of mobile devices, such as tablets, smartphones, and e-readers. According to a Gartner survey on sales in 2013 [18], the Android [3] platform had an increase of 127% over the previous year with approximately 121 million units sold. Thus, Android took the lead of the current market in the list of systems and applications developed for mobile environments with 62% ahead of Apple iOS [4] and Microsoft Windows Phone [39].

Due to the expansion in the number and diversity of mobile device users, the study of new testing approaches is essential to reduce the occurrence of faults and thereby ensure a better quality of mobile applications. According to Muccini et al. [27], the mobile context has characteristics that directly influence the testing activity, such as connectivity, limited resources, autonomy, user interface, context awareness, adaptation, new operating systems and programming languages, diversity of settings, and touch screen.

A special attention should be directed to the testing phase in mobile applications in order to improve the design and generation of test cases, as well as evaluating methods and tools available for verification and validation. Moreover, it must always be considered points of attention as cost, fault detection effectiveness, and the ability to automate test cases.

In this context, one of the techniques that can be applied to the testing activity to ensure software quality is Model-Based Testing (MBT). According to Utting and Legeard [37], MBT allows the automatic generation of test cases through a model built based on the expected behavior of software under test (SUT). MBT is an approach that has several advantages reported in the literature, such as the automatic test case generation, fault detection effectiveness, and reduction in time and cost for testing [37][7][19].

This paper aims to evaluate the use of the MBT concepts in the design and execution of automated tests in mobile applications. In particular, the research was focused on mobility solutions developed in the Google Android platform.

The following research questions have been defined: *Q1 – "Can the concepts of MBT be used in its current state to verify and validate functional requirements in mobile applications?"*; *Q2 – "What are the results and challenges identified from adoption of MBT in mobile applications?"*; and *Q3 – "How effective were the models and test cases generated, implemented, and executed in the mobile application evaluated?"*.

This paper is organized as follows: Section 2 presents the literature review on MBT and modeling technique called Event Sequence Graph (ESG). Section 3 discusses the testing of mobile applications and contextualizes the main related work. Section 4 describes the study configuration. Section 5 analyzes and discusses the results obtained from the experimental study. Section 6 discusses the threats to validity. Finally, Section 7 presents the conclusion and sketches future work.