Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X

IJCSMC, Vol. 3, Issue. 5, May 2014, pg.875 – 878

REVIEW ARTICLE

A REVIEW: GUI TESTING

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ABSTRACT: Due to outburst in technology and software usage, testing the software is an important task. As GUI's are critical components of today's software, there should be more emphasis on GUI testing. Testing GUI's correctness is critical for system usability, robustness and safety. The testing needs to be performed in a way that it improves the overall performance of GUI. Any application with poor user interface can lead to many problems. The importance of GUI tests lies in the fact that they are performed from view of end user of product. Therefore goal of GUI testing should be enhanced fault detection rate, good path coverage and increased efficiency. The challenges present in GUI testing may discourage developers and testers to the point that they may stop writing test cases. Due to contribution of good GUI in software success GUI testing is major concern, there exist a great requirement to include GUI testing in software testing process and a number of methods have been proposed by various experts for this purpose.

Index Terms – GUI testing, applications, GUI Tests, tools

I. INTRODUCTION

GUI is a program interface that takes advantage of graphics capabilities of computer. GUI provides use ran easy way to interact with software [10]. GUI acts as interface between user and software. GUI makes the software interface easy but they also complicate the software development process [11]. Due to sophisticated and complex GUIs there is a need of GUI testing to ensure correctness of GUI. Any complexity in software needs to be tested because untested code is potential source of bugs. GUI testing is vital to make entire system safer and more robust. GUI testing is an area of growing importance, facing a number of challenges.

GUI testing is a set of activities used to test the GUI of any product to ensure that it meets its written specification. The whole system can be executed by means of GUI. GUI has many operations that need to be tested. We test GUI

from different perspective which includes test coverage, test case generation, test oracle and regression testing [1]. Different researchers have proposed techniques keeping in view the different aspects and features of GUI [1] .Objective of each technique is to generate test cases which are capable to detect maximum faults. GUI testing provides an assurance of proper functioning of application/software. GUI testing can be done by manual methods which are time consuming and are not so much used or by automated methods which are used nowadays.

II. GUI TESTING APPROACHES

GUI testing, a technique used to detect errors in a product under test using different approaches. GUI testing is usually performed using test cases. More than one test case is required to test the functionality of GUI [2]. Test cases can be generated either manually or by automated methods. Various approaches have been proposed for GUI testing and each has its own advantages and disadvantages.

MANUAL GUI TESTING:

Manual testing is based on domain and application knowledge of tester. Manual testing is done by tester itself. Manual testing is error-prone and there are chances of most of test scenarios left out. **Heuristic methods** are used for manual testing in which a group of specialists studies the software to find problems. In **cognitive walkthrough**, the developers walkthrough software. The actions and feedback of interface are compared to user's goals and knowledge and the points that need improvement are noted**. Usability tests**, a manual testing method involve studying the software under controlled conditions with evaluators gathering data on problems that rise during its use.

Manual testing can find bugs that are difficult with automated tests (usability problems), is good for initial testing. On the other hand it requires more efforts, provides weak coverage.

AUTOMATED GUI TESTING:

Automated GUI testing involves carrying a set of tasks automatically and comparing the result of same with expected output [6]. Automated GUI testing is a solution to all issues raised with manual GUI testing. Automated testing approaches are:-

Capture-Replay tools that works by two different interacting and execution modes and provides advantage of output check, test case recording.

Unit-Testing frameworks like Joint, Nun it, they provide flexibility, support Test Driven Development and automatic test execution.

Model based testing based on execution of user sessions selected from a model of GUI. It means that testing is based on some form of a (computer-readable) model that describes some aspects of the tested system in a way that enables automatic or semi-automatic test generation. [12]

III. GUI TESTING RAISES SPECIFIC CHALLENGES

Although GUI makes the software easy to use but GUI testing has many problems that can cause an issue while testing the software. These issue should be handled using appropriate methods to ensure the quality of software. **Domain size** is one of them. In a large program there are large numbers of operations that need to be tested.

Sequencing problem is another difficulty. Some functions can only be performed with a sequence of GUI events [6]. This can become a serious issue during manual testing. **Regression testing** is also a difficulty because of significant changes in GUI [6]. GUI test automation is harder and controlling GUI actions is difficult. Also

observing visible GUI state is difficult and observing invisible GUI state is almost impossible. State space and test case explosion are other challenges.

IV. GUI TESTING ON VARIOUS APPLICATIONS

Industrial GUI System:

Penelope Brooks and B. Robinson [3] developed GUI testing methods that are relevant to industry applications. He characterized GUI systems using data collected from defects. Beazer's defect taxonomy was used as basis to classify the defects. Different categories are present, each describing specific defects.

If any failure occurs, it is analyzed to find under which category it comes, and then this classification is used to design better test oracle to detect such failures.

Open Source GUI Applications:

Qing Xie and Atif M. Memon [5] presented a new approach for continuous integration testing of web –based community driven GUI- based open source software. Developers make changes to code through WWW so it is prone to more defects. Three concentric loops are used to automate model-based testing of evolving GUI-based OSS. **Comprehensive testing** is the third technique that conducts detailed GUI integration and it is executed after a major version of GUI is available. The second technique is **smoke testing** that operates on each day's GUI build and perform functional reference testing of newly integrated version of GUI, using previously tested version as baseline. The innermost technique **crash testing** operates on each code check-in of GUI software and it performs quickly also. The limitation is the interactions between three loops are not defined.

Rapidly Evolving software:

AtifM.Memon used Daily Automated Regression Tester (DART) to automate GUI smoke testing. The key to success of DART is developers work on code during day time and DART automatically launches Application Under Test (AUT) during night time, builds it and runs GUI smoke test.

DART automates everything required for GUI testing including structural GUI analysis, test case generation, test oracle creation. The effectiveness of DART depends on GUI ripper capabilities.

Web Applications:

GUI testing of web applications is slightly different than testing other applications, in involves testing navigation, usability, instructions and images [9]. Automated web tests are designed to eliminate defects and to provide accurate results. These tests reports the issue that can cause risk to proper usability and functioning of web GUI. Rational functional tester(RFT), JSpe, RHinoUnit are some tools used for testing purpose.

V. GUI Testing Tools

To make testing easier and to motivate developers and testers to work in this field various testing tools are provided with different specification and uses.

WinRunner , GUITAR , Rational Robot, Spec Explorer , IBM Rational Functional Tester (RFT) ,

Watir , Android are some GUI testing tools. [7]

VI. CONCLUSION

In this paper we have studied GUI testing approaches along with their benefits and limitations. We have studied the problems which arise while testing the GUI's of any product. We also reviewed the GUI testing on various applications. This paper provides an overview of GUI testing and approaches used for the purpose. Different approaches are used according to requirements and environment. It also helps us to choose the approach for testing in order to do GUI testing in an improved way.

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