

Entropy Based Test Cases Reduction Algorithm for User Session Based Testing

Hsu Mon Maung and Kay Thi Win

Abstract Web applications are crucial role for daily user activities such as online banking, online shopping and searching. It is important to ensure the reliability and web application testing has been used in finding various faults in order to improve the quality of reliable web services. Among test cases generation approaches, user session based testing is an approach to create test cases with real user data. However, real user data usage is extremely large and executing all the test cases can be time consuming in practice. This paper describes the test cases reduction approach for analyzing and replaying the large number of test cases generated from user session data. The entropy gain theory is applied in test cases reduction process to get the best test suite that covers all user accesses of web application. To evaluate the effectiveness of proposed method, the analytical results are described in terms of URLs coverage, reduction time and test cases reduction rate.

Keywords User session based testing · Entropy gain theory · Test cases reduction

1 Introduction

As most daily activities rely on the services provided by web applications (WA), the qualities of these applications are central role. Testing web applications is an integral part of software development process in order to ensure software quality. However, web application testing is a very expensive process in terms of time and resources due to the nature of web application. Testing, designing and generating test cases are challenging tasks because web application is complex and changeable. There are different types of web application with the goal of finding faults in the software under development. User session based testing has been recently researched as a way for effectively testing web application. This technique is a capture/replay mechanism that collects user data with user

H.M. Maung(✉) · K.T. Win
University of Computer Studies (UCSM), Mandalay, Myanmar
e-mail: {hsumon77,kthiwin11}@gmail.com

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interaction from web server and these collected data are transformed into test cases in the form of http requests. For web application system, field data has the additional advantage because the usage data is independent of the underlying implementation and server technologies, thus reducing the costs of finding inputs [1]. User session based testing is less dependent on fast changing technologies used by web applications and it can generate test cases using real user data without analyzing the internal structure. In this testing, a tester captures user accesses during deployment to create user session which are then replayed as test cases. A major problem with user session based testing is the cost of collecting, analyzing, and replaying the large number of test cases generated from user session data [2]. Many researchers have proposed selection and reduction methods of test suites in user session based testing because the collected daily user logs are million gigabytes that are impossible to replay as test cases. However, the effectiveness of this testing technique depends on the collected user session data set. To design test cases effectively, the strategy is needed to be not only reduce test suite size but also cover each possible user behavior. This paper presents an approach for achieving high efficiency test results in user session based testing by reducing the overhead of selection and analyzing user session data. The main goal of paper selecting test cases for test suite reduction based on entropy value analysis. A reduced set of user session data is produced by applying proposed entropy based reduction algorithm. Some preliminary case studies were carried out to validate the proposed technique and to evaluate its effectiveness.

In the remainder of this paper, the related work is described in Section 2. Testing web applications and user session based testing are described in Section 3 and 4 respectively. In Section 5, we present methodology, entropy based heuristic for test suite reduction. Section 6 describes experimental study with two subject applications for evaluation process. The paper is concluded in Section 7.

2 Related Work

In this section, several researches related with testing web application are described.

Sampath et al. [3] explored the possibility of using concept analysis for achieving reduction and scalability in user session based testing of web applications. This method is completely automated user session selecting, reduction through replay process. The studies showed that concept analysis can provide incrementally updating reduced test suite. The authors also admitted the importance of request data and ordering.

The studies [4] explored a method of estimating dependencies automatically and using them to arrange the test suite. The authors depicted some limitations of an approach to testing Web applications automatically and introduce some ideas for improving upon it.

Ebrahim Shamsoddin-Motlagh reported a survey of recent research to generate test case automatically. Those are presented from UML based, graph based, formal methods, web application, web service, and combined methods [5].

H.M.Maung [6] proposed the framework for user session data reduction in web application testing. The authors also discussed validation methods for evaluating the effectiveness of this approach.