Model Driven Testing based on Functional Test Case Generation with Redundancy Check

Aadil Farooq[1], Pramod Jadhav[2], S.D.Joshi[3*]

[1,2,3]Dept. of Information Technology, Bharati Vidyapeeth Deemed University College of Engineering,
Pune Deemed University, Pune, 411043, Maharashtra, India

Abstract- Software testing is a major component of software development lifecycle and it's time-consuming. The testing used the particular time in testing is generally disturbed with generating the test cases and correctly testing them. Although some people apply k-means clustering algorithm to the test suite reduction, the algorithm is unstable and seldom considers the coverage rate of such test cases; as a result, it will waste various unnecessary testing times in redundant cases and always result in high cost. Model-based testing method is one of the testing categories in which the test cases derived from that the system describes efficient aspects of the system under test. When the model of the system is described explicitly, reversing system performed correctly, it can be used for the renewable artifact. For instance, the system can be used to generate an appropriate test set for the SUT. Such technique is called model-based testing (MBT).The different approaches are implemented and evaluated in order to determine its effectiveness in reducing the redundancy of test case generation. The purpose of this project is to generate the test cases, prioritize them.

Keywords- Software testing, test suite reduction, code coverage.

I. INTRODUCTION

Model-based testing method is a type of testing in which test cases are derived as of the system so as to describe an efficient aspect of that system under test. When the system representation is described explicitly, reversing system performed correctly, it can be used for the renewable artifact. For instance, the system can be used to generate an appropriate test set for the SUT. Such approach is called model-based testing (MBT). Model-based testing types allow automatic creation of test cases from models of the system to construct. However, physically resulted test cases are more efficient in searching errors. To decrease the attempt, but also remains the advantages of manually resulted test cases a disintegration of test cases is presented. Decomposition has to be modified to the decomposition of the system model. The purpose of this system work is evaluated these decompositions and expand a method to move them to the test cases of system. The system grants the repeating of manually resulted test cases at various phases of a software development life cycle.

In software development process, software testing is important in safe guarding the software quality. The purpose of the software testing was to provide the software related staff an objective view of the software quality **[1].** The software testing fell into two types: the black-box testing and the white-box testing. In both approaches, test case is generated according to the testing requirement to achieve the test objectives. As a result, the same testing demand might be covered by many test cases, which has caused redundant cases in the test suite to a large extent and thus cost a large amount of time in such redundant cases when the testing engineers are testing the cases. Traditional test suite reduction used greedy algorithm, heuristic algorithm or integer programming and other method store move redundant test case **[2].**The basics for these reductions are that the coverage degree of each test case remained unchanged during the execution of the test, and the cost of their execution is equal. Most importantly, the reduction was carried out in the generated case and does not take into account the relationship of testing requirement, so it cannot guarantee the full test of the test objectives fundamentally. At present, some scholars put clustering to use in test suite and achieved certain effect. For example, test case prioritization using Ant Colony optimization **[6]**.

Model based testing approach will explain the techniques or methods utilized for performing the testing activity. **[2]** In the Model Based Testing we are going to implement the algorithm called as graph search algorithm. This Graph search algorithm will be utilized for different types of testing such as evolutionary, random, model, segmentation, bug finding, and interpretation and so on. Test suite reduction methods attempt to eliminate unnecessary test cases of a test suite. The problem of test suite minimization is effectively solved in this reduction method of test cases.

II. RELATED WORK

In this project, Authors **[1] Feng Liu, Jun Zhang, Er-zhou Zhu** proposes a effective technique of test suite

optimization method for k-medoids thought of the clustering algorithm and then proposes a method of parameter generation test suite characterized by cyclomatic complexity and code coverage rate. This method utilizes the greedy algorithm to process the streamlined test suite while guaranteeing the cases coverage rate and the error detection rate finally gain the minimal test suite. Traditional test suite reduction used greedy algorithm, heuristic algorithm or integer programming and other method store move redundant test case. This project described clustering algorithm to construct the optimizing test case set, and selected the k-medoids algorithm instead of the k-means algorithm to ensure that the division of the whole set of case wasn't impacted by the instability of the algorithm in the process of the division of optimizing test case. Some researchers have combined k-means algorithm or k-medoids algorithm with software testing, and proposed a reduction method of test suite based on clustering and achieved some results. Finally, shows the experimental results, our method features higher coverage rate with lower complexity under the streamlined test suite of the same quantity.

In this paper, Authors **[2] Kartheek Muthyala, Rajshekhar Naidu P** proposes a method for data mining approaches to decrease the different type of test cases. Data mining approach finds same patterns in test cases which helped us in finding out the redundancy of test cases included by automatic achieved test cases. This system approach mainly deals with the issue of redundancy of test cases. In testing, the redundant test cases increase the time catches through the phase of software testing. With increase in number of test cases within limited time. The application of data mining methods to that test suite appreciably minimizes the test suite. The coverage **[2]** either path or provisional by the reduced test suite yielded good results. In this project; they recommend one method such extracts the test suite performance by clustering technique. In previous methodology, we proposed the some necessary understanding of concepts related to software testing and data mining. They examined several issues related to software testing and the test suite size. They demonstrated about the computerized test case generators and the redundancies of test cases they incorporate. This effective method is expanded in various unit cases and tested for analysis and they produced good results.

In this project, Authors **[3] Mohammed Akour, Iman Al Jarrah, Ahmad A. Saifan** proposes an efficient method of test suite reduction using clustering algorithm. This study aims at reducing the cost of the test by removing the redundant test cases. This methodology begins with generating the test cases randomly. The Procedural Language/Structured Query Language (PL/SQL) tool is used

to create test cases from the payroll system database functions. The SPSS software package is used to apply the K-means Clustering algorithm to decrease the test cases **[3]**.Test suite reduction technique aims at identifying and removing all the redundant test cases; therefore, we decrease the number of tests from the test suite. Generally, difficult to get the minimum separation of the unusual test suite, which captures every requirements of T and covers the similar position of the test necessities is a NP-complete hard issue. Redundancy is duplicated information among various test cases. Those similar test cases cost too much. The results showed that K-Means Clustering algorithm is a good test suite reduction method, since it accordingly helps us to create the redundant test cases and reduce that test cases.

In this project, Authors **[4] Marwah Alian, Dima Suleiman, Adnan Shaout** they introduce a technique of test suite reduction nusing the most important type of regression testing. Thus, regression testing technique removes the unnecessary test cases in the testing suite and also save the price of this stage. Regression testing returns the type of testing suite to make sure that an original side. Different approaches are recycled to contract through the issue of regression testing. The survey of this paper is moving to categorize the methods of regression testing reduction problem. The main purpose of projected algorithms is to decrease the range of test suite. In this survey, they utilize idea of set theory to decrease the superior test suite **[4]**.The principle of the research is to gather and examine projects that contract through one of the techniques of regression testing. It is significant to expand methods to decrease accessible test suites for the reason that of the time and source constraints for re-executing huge test suites. They arrange test case reduction methods into: requirement based, coverage based, program slicing, genetic algorithm, greedy algorithm, hybrid algorithm, clustering and fuzzy logic. Finally the survey is going to categorize the approaches of regression testing problem of reduction.

In this project, Authors **[5] Yulei Pang, Xiaozhen Rue, Akbar SiamiNamin** proposes a method of identifying effective test cases throughout the technique of regression testing. They recommend test case categorization method depend on k-means clustering through the principle of dividing test cases into two parts of useful test cases. The method of clustering approach is depend on the Hamming distances calculated above an several among coverage data achieved for existing or before issues of the program under test. This experimental survey obtains the clustering-based test case categorization may recognize the efficient test cases through high memory ratio as well as noticeable precision percentage. This project proposes a categorization of test cases into two sets with k-means clustering. The main goal is implemented sections of software program as well as associated implemented test cases and removes a require for

executing non-effected test cases. Finally, in this project, they presented a test case categorization methodology located on k-means clustering to improve regression testing method. Depend on the outcomes they achieve the clustering method depends on test case categorization be able to gather test cases through high recall ratio and significant precision proportion.

In this project, Authors **[6] Yogesh Singh, Arvinder Kaur, Bharti Suri [6],** they introduce the method of test case prioritization using regression test prioritization method. Regression testing is mainly a preservation action that is achieved usually to make sure the ability of the changed program. In prioritizations technique, test cases are prearranged like the largest priority test case is implemented previous than lesser precedence test cases. The precedence is place according to selected criterion to enhance the charge of fault recognition and to get highest code coverage or to wrap up significant aspects previous and so on. While implementation duration is small then they require having point control the prioritization method. They have determined selection and prioritization technique depend on ACO to conclude the result is closest to highest solution **[6]**.This project proposes the regression test prioritization approach to recognize test in time.

In this project, Authors **[7]** **M. Lakshmi Prasad, M. Keerthi, K. Sai, Srikar, V. Divya** they propose an effective method of generating test cases by using k-means algorithm. In order to get improved result, this project proposes a hybrid optimization algorithm by using data mining techniques. Data mining technique catches similar patterns in test cases which helped us in finding out redundancy included by automatic generated test cases. These experiments are achieved to evaluate the proposed algorithm. The presented method of data mining approach is utilized for software testing to eliminate redundant test case so that test suites are decreased. In this project, the major aim is to decrease the instant used in testing through removing number of test cases. For the data mining technique of clustering method is utilized for software testing to minimize the test suite. In this project, we custom the data mining approach of clustering method i.e. k-means and k-medoids are used in testing to decrease test suite to achieve the optimality and improve an efficiency of software testing. Therefore, they completed that an optimization technique was implemented to generate the optimized pair wise test cases for testing which helps in many applications.

In this project, Authors **[8] J.J. Gutiérrez, M.J. Escalona, M. Mejías,** they presented the system of Model Driven approach for the creation of functional Test Cases.To focus on quality attribute of s/w testing to improve the performance. Testing phase is one of the significant stages in software development field to declare the quality of system.

Functional test cases of system confirm that system under test achieves its functional requirement in this paper. Therefore, the test cases are commonly intended from various scenarios represented in functional requirements. The goal of this project is proposed an efficient procedure depend on Model-Driven paradigm to computerize the creation and implementation of efficient test cases from the system requirements. Limitations of this system are that, Missing few external quality attributes like reliability, Maintainability. The project finish explaining learned lessons from the toughs and suitable future research and conclusions that illustrate original research in the test cases creation context.

In this survey, Authors **[9] Mohamed El-Attar, Hamza Luqman, Peter Karpati, Guttorm Sindre, Anjali Sharma et al** they proposed the Model the security aspect and to maintain semantic transparency. Model-driven protection has grown to be a dynamic region of study through previous years. As several study mechanisms have provided automatically to the aim with approaching accepted modeling representations to the security of model conditions, here is a small modeling method maintain for the state-based aspects of protection problems. The survey offers the method to present an original notational position that expands UML state charts information. These review outcomes specify that original information enclose the position of interpretation needed in security modeling expression as well as were mainly perceptive to utilize and appreciate produced very small training. The main searching was a new system is more efficient than the creative notational position of UML state charts while it was allowable subjects to study models formed with new system. Limitations of this system that, it is dependent on other factor of Object oriented & modeling. They have presented work for designing such algorithmic rule that will be utilized to get the test cases.

III. RESULTS AND DISCUSSION

Final result of the proposed system is test cases which are generated from the activity diagram which is given as input to the system. Before that we get activity dependency table ADT and then ADG. Also the system shows the test cases flow i.e. in which order performed generated test cases.

IV. CONCLUSION

In this paper, uses the clustering algorithm in the reduction of test case. According to our experience, the input activity diagram maintains the flexibility appropriately for defining the requirements. Also, these diagrams are applicable for automatic processing. The activity diagrams give some notation and these notations are referred for describing the model. The proposed method is able for creating more

capable or proficient test suit by saving the time of the test. Also, it saves the effort and increases the quality of the test cases which was generated by this method. In short, the general performance of the testing process can be improved by this method. Here we are dealing with the mechanism of test case prioritization by giving the importance to the functional requirements more. The proposed system has another feature of detecting the duplicate test cases and decreasing of redundancy of test cases as well. Actual execution of the project proves that the method carries generation of redundant test cases on which testing team has to recognize it manually.

CONFLICT OF INTEREST

There is no conflict of interest

ACKNOWLEDGMENT

REFERENCES

[1] FENG LIU, JUN ZHANG, ER-ZHOU ZHU, "TEST-SUITE REDUCTION BASED ON K-MEDOIDS CLUSTERING ALGORITHM", CONFERENCE ON CYBER-ENABLED DISTRIBUTED COMPUTING AND KNOWLEDGE DISCOVERY.

[2] KARTHEEK MUTHYALA," A NOVEL APPROACH TO TEST SUITE REDUCTION USING DATA", Indian Journal of Computer Science and Engineering (IJCSE), Computer Science and Information Systems, Birla Institute of Technology and Science, 2011.

[3] MOHAMMED AKOUR, IMAN AL JARRAH, AHMAD A. SAIFAN,"AN EFFICIENT APPROACH FOR TEST SUITE REDUCTIONUSING K-MEANS CLUSTERING", Journal of Theoretical and Applied Information Technology,15th September 2018,Vol.96. No 17, 2018.

[4] Marwah Alian , Dima Suleiman , Adnan Shaout ,"Test Case Reduction Techniques – Survey", (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 7, No. 5, 2016.

[5] Yulei Pang , Xiaozhen Xue , Akbar SiamiNamin ,"Identifying Effective Test Cases Through K-means Clustering for Enhancing Regression Testing",2013 12th International Conference on Machine Learning and Applications.

[6] Yogesh Singh, Arvinder Kaur, Bharti Suri," Test Case Prioritization using Ant Colony Optimization", DOI: 10.1145/1811226.1811238, July 2010 Volume 35 Number 4 DOI: 10.1145.2010.

[7] M. LAKSHMI PRASAD1, M. KEERTHI2, K. SAI SRIKAR3, V. DIVYA4,"Generating Optimized Pair wise Test Cases by using K-Means Algorithm,"ISSN 2348–2370 Vol.09, Issue.05, April-2017.

[8]J.J. Gutiérrez, M.J. Escalona, M. Mejías,"A Model Driven Approach for Functional Test Cases", Elsevier 12 August 2015.

[9] Mohamed El-Attar, Hamza Luqman, Peter Karpati, Guttorm Sindre," Extending the UML State charts Notation to Model Security Aspects", Member, IEEE, and Andreas L. Opdahl, Member, IEEE, Springer July 2015.

[10] Anjali Sharma and Maninder Singh, "Generation of Automated Test Cases Using UML Modeling", International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 4, April - 2013 ISSN: 2278-0181.