

Automated Slicing Technique for Test Case Prioritization

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Abstract- Regression testing is used to retest the component of a system that verifies that after modifications defects are removed from the effected software. Automation tools are required for these types of testing. The test case prioritization is the technique of Regression testing in which test cases are prioritized according to the changes which are done in the project. This work is based on manual slicing and automated slicing for test case prioritization to detect maximum number of faults from the project in which some changes are done for the new version release. The slicing is the technique which will divide the whole project function wise and detect associated functions. Each project has seven functions and four numbers of changes are defined for the regression testing. In the simulation it is being analyzed that fault detection rate is increased and execution time is reduced with the implementation of automated test case prioritization as compared to manual test case prioritization in regression testing.

Keywords- Test case prioritization, function importance, fault prediction

I. INTRODUCTION

A software engineering is related to all the aspects that are used in the software production. Software is basically a generic term, which is used for organizing the data and instructions that are collected to develop it. The software is broken into the two categories: system software and the application software. The system software is used to manage the hardware components, so that other software or user sees it as a functional unit. Software engineering is a systematic, disciplined and quantifiable approach to design, development and maintenance of software within cost, time and other constraints [1]. Systematic and disciplined means the developer apply a well understood technique in an organized and discipline way. Cost, time and other constraint means software developer must ensure that software must be produced within limited budget and time. Other constraint means software developer must have great knowledge about what is required to produce a system and how each activity should take place in systematic way during development process. As software requirement is increases day by day. So it is necessary to maintain the good quality software [2]. To develop good quality software, software engineering is required. For this, the developer's needs to adopt the software engineering concepts, strategies, and practices to avoid the conflicts that are occur during the development process. Software engineering is an approach to develop, maintain and operate the software. The software development plays a crucial

role in software engineering. Many specific techniques are required to develop software. The most common thing in development process is the requirement gathering and customer needs. If a developer fails to complete the needs of the customer than he or she may fails to develop good quality software. Software can be said to of good quality, if it is able to fulfill the needs of the customer [3]. The customer can be satisfied in terms of quality, cost and design of the system software. A test case is set of procedure use to test the software. Test case is a set of condition under which a software tester determine whether the application or software system is working correctly or not. To design a test case for particular software the designer must design positive or negative test case for the software. Positive test cases are design to check software under normal condition and negative test case are design to check software at extreme condition. The order of test case execution affects the time at which goals of testing are being fulfilled. If the goal is fault detection then a improper execution order might reveal most of fault late which leads to delay in bug fixing activity and the delivery of software. A mechanism is needed for arranging a test case in appropriate order to increase their effectiveness at meeting some performance goal and rate of fault detection such mechanism is known as test case prioritization [4]. Test case prioritization is a method to prioritize and schedule test cases in appropriate order. To run test cases of higher priority before than the lower priority test case in order to minimize time, cost and effort during software testing phase. Various performance goals are like rate of fault detection which a is a measure of how quickly the fault is detected so that during testing faster feedback can provide about system under testing and allow the software tester to correct the software at earlier phase as possible. Software testing is a procedure of testing or comparing the actual outcome with the expected outcome. Testing of the software is done in order to check the correct functionality of the system or project. If the testing will not be performed then system may lead to catastrophic or improper results in the field. So it's better to check or test the system earlier, so that the excellent results can be produced [5]. Regression testing is a testing that refers to that section of the test cycle in which programs are tested to make sure that changes do not affect features that are not believed to be affected. The process of verifying the customized software in the maintenance phase is known as Regression testing. Time and budget constraints are its major disadvantage due to complex process. Regression testing is the re-execution of a number of subset of test that has previously been conducted. In regression testing as integration testing takings, number of regression tests increases and it is not

practical and ineffective to re execute every test for each program function if once change occurs [6]. It is an expensive testing process used to detect regression faults. Research has shown that at least 50% of the total software cost is comprised of testing activities. A Genetic Algorithm is basically a searching techniques, it is used in the computer science. It helps to find approximate solutions for any optimization problems. The genetic algorithms are known as the evolutionary algorithms. In this many techniques are involved by evolutionary biology such as inheritance, mutation, natural selection, and recombination. In the representation of the genetic algorithms the fitness function is defined. The genetic algorithm proceeds to initialize the solutions randomly.

II. LITERATURE REVIEW

Shifa-e-Zehra Haidry et.al (2012), several existing test case prioritization technique consider that test can be run in any order. This paper presents test case prioritization techniques that use dependency information from test suit to prioritize the test suit. These techniques observe the dependency between the test cases and use this information to prioritize the test case. In this paper two technique are used to find the dependency between the test cases. These are open dependency and closed dependency. The technique which is used to assign the priority to test case based on dependency information of that test case is called dependency structure prioritization. The test cases that have more dependents the coverage value is higher of those test cases. This paper offers a solution to test case prioritization problem when dependency exists between the test cases [7].

Thillaikarasi Muthusamy (2013), in this paper they revealed that scheduling test cases by using test case prioritization technique enhances their efficiency of attaining some performance criteria. The rate at which the errors are detected within the testing process is one such criterion. An enhanced rate of fault detection during testing can provide quicker feedback on the system under test thereby allowing s/w engineers to rectify errors before usual time. The proposed technique is validated with three different validation metrics and is experimented using two projects. The algorithm illustrated detects serious errors at earlier phases of testing process and effectiveness between prioritized and un-prioritized test cases is compared using ASFD [8].

Siriprong R et.al (2010) presented that software testing has been proven that testing, analysis, and debugging costs usually consume over 50% of the costs associated with the development of large software systems. Many researchers have found several approaches to schedule an order of test execution. Unfortunately, existing test prioritization techniques are failed to prioritize multiple test suites and test cases with same priority values. Thus, this paper proposes two new efficient prioritization methods to address the above issues. The first method aims to resolve the problem of many test cases assigned the same weight values. The second method is developed to effectively prioritize

multiple suites. As a result, this paper discusses an ability to reserve high prioritize tests in multiple suites while minimizing a prioritization time [9].

Thillaikarasi Muthusamy et.al (2014) presented that regression testing concentrates on finding defects after a major code change has occurred. Specifically, it exposes software regressions or old bugs that have reappeared. It is an expensive testing process that has been estimated to account for almost half of the cost of software maintenance. To improve the regression testing process, test case prioritization techniques organizes the execution level of test cases. Further, it gives an improved rate of fault identification, when test suites cannot run to completion. The algorithm is based on analysis of the percentage of test cases performed to find the faults and on APFD metric's results. Abiding by the percentage of executing test cases in earlier fault detection is important as sometimes regression testing ends without executing all test instances [10].

Bharti Suri et.al (2012) have proposed Hybrid technique based on BCO for analyzing text case selection and by applying this technique new tool generate. Their results show that a huge amount of reduction in test suite takes place. Reduction in test suite reduces time as well as cost. They have proposed hybrid approach combining BCO and genetic algorithm which proves much faster than ACO technique. The tool which they developed runs much faster to provide the minimum subset of test cases. The tool can provide different results in each run. This implementation is done to improve correctness and efficiency of the tool [11].

Suman et.al (2012) have discussed Regression testing is the process of validating modified software to assure that changed parts of software behave as intended and unchanged parts of software have not been adversely affected by the modification. In this approach, a new Genetic Algorithm to prioritize the regression test suite is introduced that will prioritize test cases dynamically on the basis of complete code coverage. Meanwhile, an approach to generating new test cases is presented using PMX and cyclic crossover and analysis is done on the basis of process cost and test cost. The overall aim of this research is to reduce the number of test cases that need to be run after changes have been made [12].

III. RESEARCH METHODOLOGY

To increase the fault detection rate of the test case prioritization, automated test case prioritization is being implemented in this work. In the first step of the algorithm, the population values are taken as input which is the number of times function encountered and number of functions associated with a particular function. In the second step, the algorithm will start traversing the population values and error is calculated after every iteration. The iteration at which the error is the highest at that point the mutation value is calculated as the best mutation value of the function. In the last step of the algorithm the function importance values are accessed according to the

defined changes and best fitness value is calculated which will be the final percentage of faults detected from the project after the particular change.

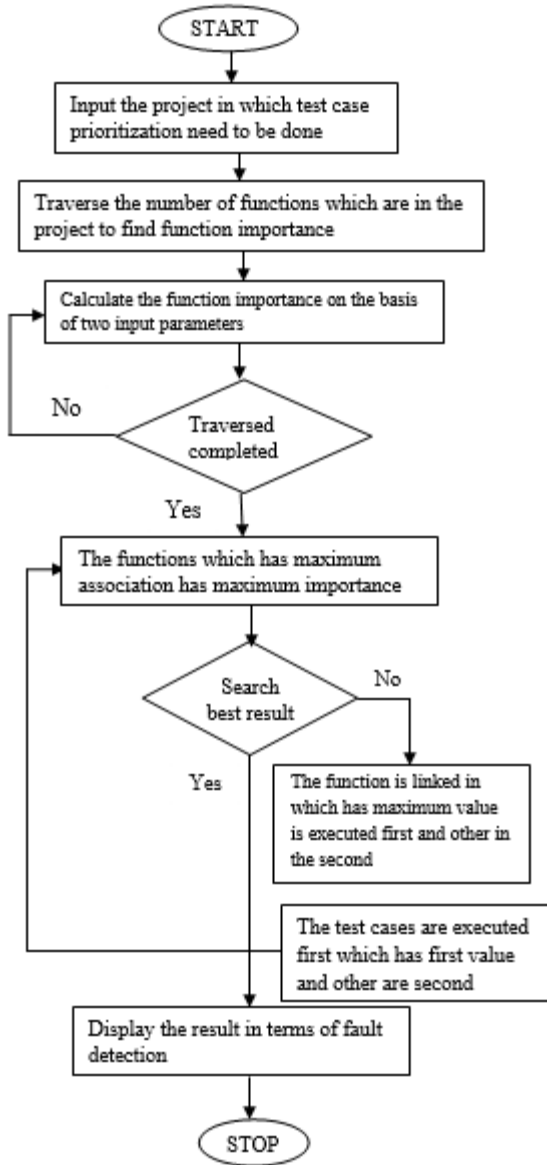


Fig.1: Flowchart of proposed work

IV. EXPERIMENTAL RESULTS

The proposed algorithm is implemented in MATLAB using guide toolbox and the results are analyzed in terms of fault detection rate.

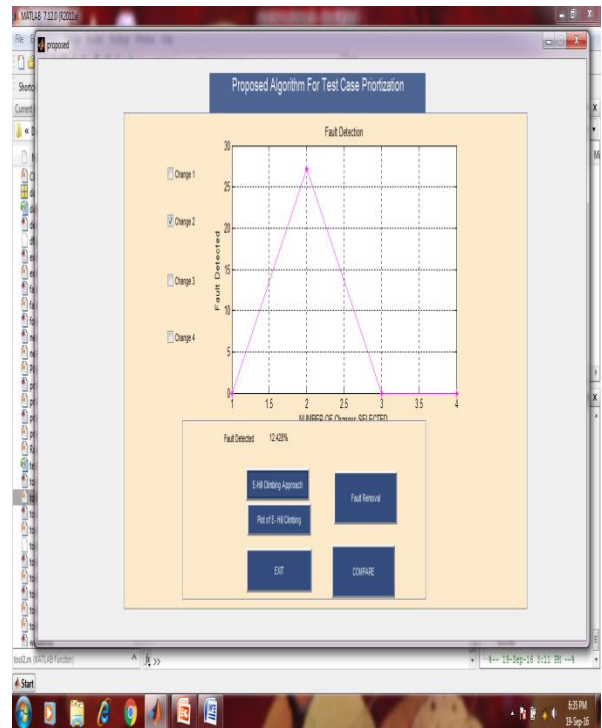


Fig.2: Fault Detected with respect to change2.

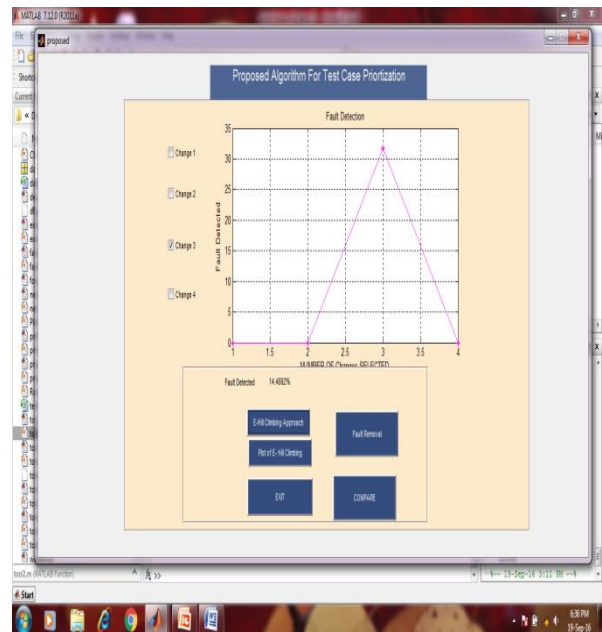


Fig.3: Fault Detected with respect to change3.

In this figure 2, we our calculating the value of fault i.e. 12.428 by using Automated Slicing Technique and enhanced multi-objective Approach with respect to change2.

In this figure 3, we are calculating the value of fault i.e. 14.4892 by using Automated Slicing Technique and Enhanced multi-objective Approach with respect to change3.

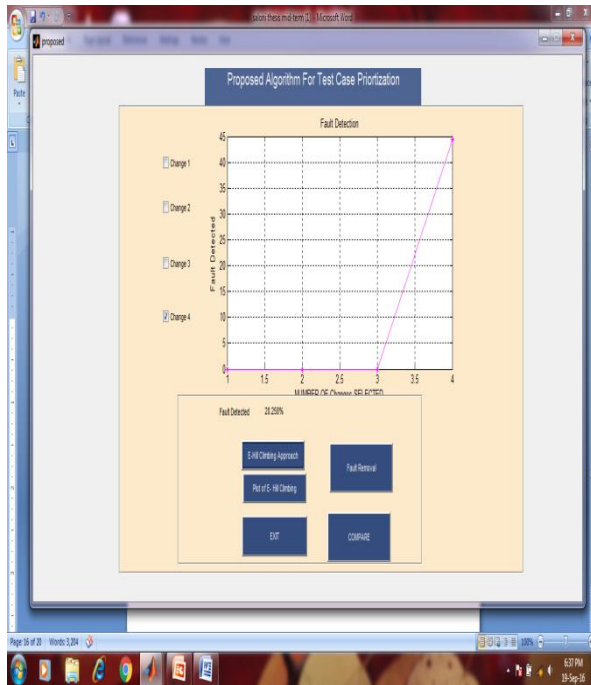


Fig.4: Fault Detected with respect to change4

In this figure 4, we are calculating the value of fault i.e. 20.258 by using Automated Slicing Technique and Enhanced multi-objective Approach with respect to change4.

As shown in table 1, the existing algorithm and proposed algorithms are compared in terms of fault detection. The proposed algorithm detects more number of faults as compared to existing technique. The online shopping project entity has columns namely: Functions, Function Execution Value, Attached Functions, Function Importance, Fitness Value, Fault Detected by multi-objective Approach, and Fault Detected by enhanced multi-objective Approach.

V. CONCLUSION

In this work, it is concluded that regression testing is the type of testing which is applied to test the project after some changes are being done for future release. The test case prioritization is the technique of regression testing which is being applied to prioritize the test cases according to the defined changes. The multi-objective algorithm works with the three steps. The first step is to select the population values which are number of times

functions encountered and the number of functions associated with the particular function. In the second step, the best mutation value is calculated which will be the function importance value. In the last step the best fitness value is calculated which will be the percentage of fault detected corresponding to particular change. To analyze the performance of proposed and existing algorithm simulation is being done in Matlab by considering ten projects with four changes. It is been analyzed that fault detection rate is increased and execution time is reduced by applying automated test case prioritization as compared to manual test case prioritization in regression testing.

VI. REFERENCES

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ONLINE SHOPPING PROJECT						
Functions	Function Execution Value	Attached Functions	Function Importance	Fitness Value	Fault Detected by multi-objective Approach	Fault Detected by enhanced multi-objective Approach
Show Products	3	6	0.5	Acc to Change 1:	Acc to Change 1:	Acc to Change 1:
Show Category	8	7	1.1429	3.309524	5.913	6.7022
Check Availability	1	6	0.16667	Acc to Change 2:	Acc to Change 2:	Acc to Change 2:
Request Order	6	4	1.5	3.166667	5.4046	12.428
Shipping	9	3	3	Acc to Change 3:	Acc to Change 3:	Acc to Change 3:
Payment Accept	2	5	0.4	3.292857	6.0006	14.4892
Cancel Order	7	4	1.75	Acc to Change 4:	Acc to Change 4:	Acc to Change 4:
				8.459524	17.8968	20.258

Table 1: Comparison