

Prioritization of Test Cases using Branch Coverage with Multiple criteria for Regression Testing

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Abstract— Prioritization of test cases is generally done to reduce the cost of regression testing. We prioritize our test cases so that those which are more important, by some measure, are made to run earlier in the testing phase. There exists a large variety of prioritization techniques in the literature, we have basically used coverage-based prioritization techniques (i.e., prioritization in terms of the number of statements, path coverage, branch coverage and fault coverage) controlling the field. A prioritized test suite which covers more than one coverage criteria is considered to be a stronger than those which cover only single coverage. The proposed method was empirically studied for bank application and the results show that the proposed work is more effective than the existing method.

Keywords — Test Case, Prioritization, Regression Testing, Software Testing.

I. INTRODUCTION

Software testing is any activity which aims at evaluating an attribute or capability of a program or system and determining that it meets its required results. The main aim of software testing is to find all the errors in a program. Its purpose is to achieve quality assurance, verification, validation, and reliability estimation. Software Testing is done by executing a program or system repeatedly and then finding the errors in it. But, in practical, even after completion of the testing phase, it is not possible to guarantee that the final program is error free. One of reason for the failure can be human's interaction with the software, perhaps a wrong input value being entered or an output being misinterpreted. Even with this limitation of testing process, we should not underestimate the importance of software testing.

We must know that software testing can depict most of the defects that are in a program and therefore software testing provides a practical way of reducing defects in a system [6].

II. TEST CASES DEVELOPMENT AND PRIORITIZATION

Test case is a set of conditions using which a tester determines whether an application or software system is working correctly or not. The basic objective of writing test cases is to validate the testing coverage of the application. Test cases should be written after understanding the function or technology that is to be tested, and each test case should be submitted for peer review. Test case is designed based on random input data.

Descriptive test cases should be prepared rather than detailed test cases because determining pass or fail criteria is usually easier with this type of case. Moreover, detailed test cases are more time-consuming to develop and maintain.

When planning the test cases, we should keep in mind that it is not feasible to test everything. Instead of trying to test every combination, we prioritize our testing so that we can perform the most important tests — those that focus on areas that present the greatest risk or have the greatest probability of occurring.

Test case prioritization technique improves regression testing by ordering test cases such that the more important test case runs earlier in the testing process [3]. This is inefficient to re execute all the test cases in regression testing following the software modifications [4]. Using information obtained from execution of previous test cases, prioritization technique is used to order the test cases for regression testing so that most beneficial are executed first thus allows an improved effectiveness of testing using minimum time and resources. [6]

Effective test case prioritization technique for regression testing is necessary to ensure optimum utility and no side effect in the software after modification [8]. Test case prioritization is rearranging the order of the test case based on certain constraints so that the most beneficial test cases may be executed first. Most of the existing research works on test case prioritization methods are based on single coverage criterion which is time consuming and more expensive [9]. A prioritized test suite which covers more than one coverage criteria is considered to be a stronger coverage goal than a test suite which covers single coverage criteria [11].

III. PROPOSED WORK

In our research we have focused on improving prioritization of test cases by adding multiple criteria for selection of test cases for testing the software by reducing the overhead of regression testing. Bank application based on Java and C++ language has been implemented according to optimized proposed work for software testing. We have tried to introduce more testing dependencies. In regression testing, we have added branch coverage, statement coverage, path coverage and fault coverage dependencies test which are helpful in finding issues in overall testing phase. Software testing has been done by various tools and we have linked to proposed theory. Test model selection and test volume

evaluation method has been applied to the software testing work of Industrial applications and has been compared with traditional method.

IV. RESULTS AND DISCUSSION

The primary concern of the software testing process is to save testing resources and to find maximum bugs from limited resources. For providing optimized solution for the same we have done changing in regression testing process by introduction of multiple criteria’s for testing. Basically we did here in our research ad hoc regression testing, testing in which test cases are made only if any bug found in application. Testing is done in two programming languages for checking compatibility and test case prioritization is consider in both of the languages for same application.



Figure 1: Execution time variation of proposed and existing work

The execution time of the proposed work is less as compared to the already existing work due to more selection criteria used for selection of test cases which make the test cases less in testing process and hence improve the execution time.

The basic comparison of proposed work and related study is done and estimated Lines of code for proposed work is found better in term of LOC for testing the program as shown in figure 2 below.

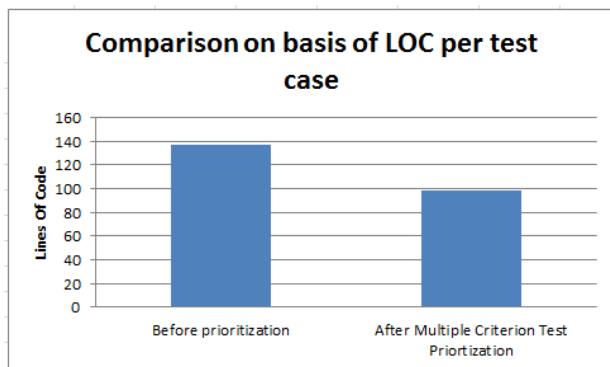


Figure 2: Variation of Lines of Code per test case for proposed and existing work

The Lines of code of a program for testing is very important factor to be considered for comparison and from this research it is found that the Lines tested for the program of the proposed work is low as compared to the existing study as the redundant code is not tested again when once tested.

Another basic comparison of proposed work and related study is done and performance of the proposed work is found better in term of number of bugs found in testing as shown in figure 3 below.

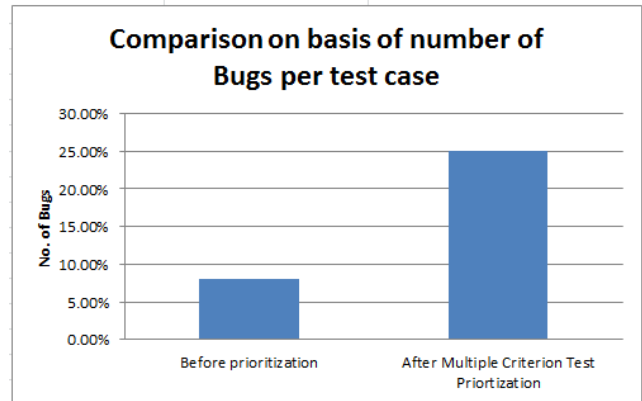


Figure 3: Variation of Bugs for proposed and existing work

The number of bugs found is high in proposed work as compared to existing work. In this research we have found 25% of bugs in same time as in proposed work where only 8% of bugs were found. The numbers of test cases are also less in number so proposed work provides better bug finding in particular time as compared to existing work.

V. CONCLUSION

In this work, a new multiple criteria based merging technique for test case prioritization is proposed to obtain test cases, after which the test cases can be prioritized. The proposed method is studied for bank application. The results show that the proposed work improves the rate of coverage criteria. The proposed work shows better result with 25 % more bug finding with execution time which is 17 % less than traditional method. In this paper, multiple criteria based test case selection process for software testing with some more features addition has been considered. The addition of more filtering criteria provides good feedback of testing and provides better regression testing by saving resources of testing.

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