A Review an Advance Approach for Test Case Prioritization for Regression Testing

Sulaxna Solanki

Post Graduate Student, Dept. of Computer Science and Engineering,
Govt. women Engineering College Ajmer, Rajasthan, India

ABSTRACT

Regression testing is the process of retesting the modified parts of the software and checking that no new faults have been created into already existing code. The regression test suite is typically large and needs an intelligent method to choose those test cases which will reduce the overall test cost. In this situation, test case prioritization techniques aim to improve the effectiveness of regression testing by ordering the test cases so that the test case with higher priority executed before lower priority. The main purpose of test case prioritization is to increase the rate of fault detection. Basically by using these two approaches, it will take less execution time to detect more faults and average percentage of faults detection (APFD) metric would be later on used to measure test case prioritization effectiveness. A priority based technique will help in priority based execution for regression testing. This paper will represent a review of various regression testing approaches and a surrey on various test case prioritization techniques using a genetic algorithm with the goal of minimizing the number of test cases that are likely to be found during time constrained execution.

Keywords- Regression testing, Test case prioritization, Genetic algorithm, Average percentage of faults detection (APFD).

1.INTRODUCTION

Regression testing starts with a possibly modified or specification, a modified program and old test plan which requires updating. Regression testing is an expensive but important process. There may be insufficient resources to allow for the re-execution of all test cases during regression testing. It is necessary to discover the technique with the goal of increasing the regression testing effectiveness, by arranging test cases of test suite according to some objective criteria. Regression testing test suite is typically large, for performing testing on test suite various techniques should be applied to reduce the cost and time. The various approaches are Retest all, test case suite, test case selection, test case prioritization are improve the effectiveness of regression testing. Test case prioritization intends to order test cases for regression testing in such a manner that test cases with higher priority executes earlier than those with lower priority, according to some performance criteria.

2.VARIOUS APPROACHES OF REGRESSION TESTING

- Retest all
- Regression test selection
- Test suite reduction
- Test case prioritization
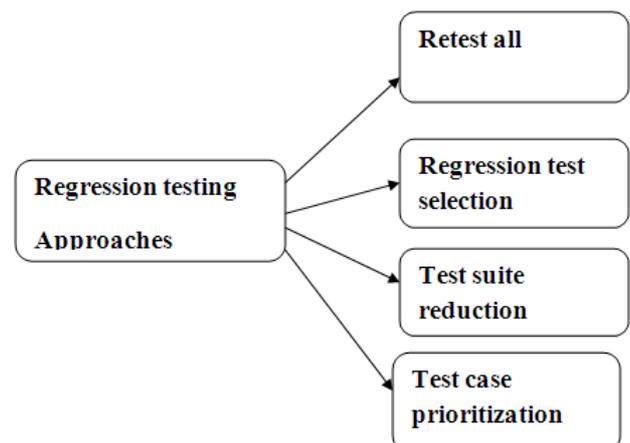
Retest All-It is the most straightforward approach of regression testing. In this simply execute all the existing test cases in the test suite [1], but this approach is time and cost consuming.

Regression test selection-Retest all technique takes time and effort as all test cases are used to test the modified program, test cases to select subset of test cases for testing [2]. Selective regression testing attempts reduce the cost.

Test Suite Reduction- This technique use information about program and test suite to remove the test cases which have become redundant with time, as new functionality is added. It is different from regression test selection as former does not permanently remove test cases but selects those that are required. Advantage of this technique is that it reduces cost of validating, executing, managing test suites over future release of software, but the downside of this is that it might reduce the fault detection capability with the reduction of test suite size [2].

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Test case prioritization- In this technique each test case assigned a priority. Priority is set according to some criterion and test cases with highest priority are scheduled first. Advantage to previous techniques is that it doesn't discard or permanently remove the test cases from test suite. Another criterion may be rate at which fault is detected [2].

3.LITERATURE REVIEW

Dr. ArvinderKaur and ShubhraGoyal [3] proposed a new genetic algorithm and prioritize regression test suite within a time constrained environment on the basis of total fault coverage. This algorithm is automated and the results are analyzed with help of Average Percentage of Faults Detected (APFD)

M. Yoon et al. [4] proposed a method to prioritize new test cases by calculating risk exposure value for requirements and analyzing risk items based on the calculation to evaluate relevant test cases and thereby determining the test case priority through the evaluated values. Moreover, we demonstrate effectiveness of our technique through empirical studies in terms of both Average Percentage Of Fault Detected (APFD) and fault severity.

S.Raju,G.V.Uma[5]"Factors Oriented TestCase Prioritization Technique in Regression Testing using Genetic Algorithm", In this paper the regression testing based test suite prioritization technique is illustrated. A new prioritization technique is proposed for the requirement based system level test cases to improve the rate of fault detection of severe faults.
S.Roongruangsuwan et.al[6] "Test-Case Prioritization techniques" researchers propose many methods to prioritize and reduce the effort, time and cost in the software testing phase, such as test case prioritization methods, regression selection techniques and test case reduction approaches. This paper concentrates on test case prioritization techniques researched between 1998 and 2008.

Sebastian Elbaum, Alexey G. Malishevsky[7] "Prioritizing Test Cases for Regression Testing", empirically examined the abilities of several test case prioritization techniques to improve the rate of fault detection of test suites. It focus on version-specific test case prioritization, in which test cases are prioritized and rate of fault detection is measured, relative to specific modified versions of a program.

Kayes [8] proposed a new metric and an approach for test case prioritization, the metric was used for evaluating rate of fault dependency. It can be defined as how rapidly dependency observed among faults. This new metric was used to determine the effectiveness of the proposed

prioritized order and compare it with non prioritized order. Various algorithms such as search algorithms and metaheuristic algorithms are also used to solve test case prioritization problem.

Bharti Suri et al. [9] used another metaheuristic technique i.e. Ant Colony Optimization for test case selection and prioritization. Random nature of ACO helps to explore the possible paths and choose the optimal from them. The results obtained were in close proximity to the optimal results. However, the best results are not found for all the cases.

Arvinder Kaur et al. [10] implemented GA for regression test suite prioritization within time constrained environment on the basis of total fault coverage. APFD metric is used to evaluate the performance of the algorithm.

S. Raju and G. V. Uma [11] implemented Factors Oriented Test Case Prioritization Technique in Regression Testing using Genetic Algorithm. In the proposed technique, Prioritization Factors (PF) was used. These factors may be concrete, such as test case length, code coverage, data flow, and fault proneness, or abstract, such as perceived code complexity and severity of faults, which prioritizes the system test cases based on the six factors: customer priority, changes in requirement, implementation complexity, completeness, traceability and fault impact. APFD and PTR metric were used to evaluate the fitness. Based on the performance measure obtained, the proposed method is effectively prioritizing the test cases.

R.Krishnamoorthi and S.A.Sahaaya Arul Mary [12] propose a new test case prioritization technique using Genetic Algorithm (GA). The proposed technique prioritizes subsequences of the original test suite so that the new suite will have a superior rate of fault detection when compared to rates of randomly prioritized test suites which is run within a time-constrained execution environment.

4.TEST CASE PRIORITIZATION IN REGRESSION TESTING

Regression testing is the process of validating modifications introduced in a system during software maintenance. Regression testing is an expensive process used to validate modified software. As the test suite size is very large, system retesting consumes large amount of time and computing resources. This issue of retesting of software systems can be handled using a good test case prioritization technique. A prioritization technique schedules the test cases for execution so that the test cases with higher priority executed before lower priority. The

objective of test case prioritization is to detect fault as early as possible. An improved rate of fault detection during regression testing can let software engineers begin their debugging activities earlier than might otherwise be possible, speeding the release of the software. An improved rate of fault detection can also provide faster feedback on the system under test and provide earlier evidence when quality goals have not been met, thus allowing strategic decisions about release schedules to be made earlier than might otherwise be possible. Test case prioritization techniques improve the cost-effectiveness of regression testing by ordering test cases such that those that are more important are run earlier in the testing process. Prioritization can provide earlier feedback to testers and management, and allow engineers to begin debugging earlier. It can also increase the probability that if testing ends prematurely, important test cases have been run. Here we suggest a new approach for test case prioritization for prior fault detection in the regression testing. A new genetic algorithm and prioritization regression test suite within a time constrained environment on the basis of entire fault coverage. This algorithm is automated and the results are analyzed with help of average percentage of faults detection (APFD). The objective of test case prioritization is to detect fault as early as possible.

5.PRIORITIZATION TEST SUITE EFFECTIVENESS

The performance of the prioritization technique used in the research it is must to access effectiveness will be measured by the rate of faults detected. Some metrics were used to calculate the level of effectiveness these are as follows.

Average percentage of fault detection (APFD) metric-
The goal of increasing a subset of test suite's rate of fault detection, we use a metric called APFD that measures the rate of fault detection per percentage of test suite execution. The APFD is calculated by taking the weighted average of the number of fault detected during the run of the test suite. APFD can be calculated as follows:

$$APFD = 1 - \frac{(tf1+tf2+\ldots\ldots+tfm)}{n*m} + \frac{1}{2n}$$

Where
n is the number of test cases
m is the number of faults
(tf1+tf2+……….+tfm) are the position of first test T that exposes the fault.
This formula represents that we can calculate APFD only when we have prior knowledge of faults contained in the program.

6.CONCLUSION AND FUTURE WORK

The paper provides a review of various regression testing approaches which mainly focuses on prioritization of test cases. Prioritization means to scheduled (or) order the execution of the test cases. It improves the software quality and rate of fault detection. Prioritization is used to reduce the time, cost and to improved the effectiveness. Test case prioritization technique will be chosen based on the user needs. Future research will be focused on studying the other prioritization techniques and on implementing the create a sample program and randomly create 500 test cases: random test suite. Make some fault in the program and calculated APFD for random test suite. Calculated branch coverage and statement coverage priorities/sort by branch coverage and statement coverage and then find APFD priorities test suites by Genetic algorithm. Recalculated APFD of prioritization test suite and compare the results used.

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