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International Journal of Computer Science Research (IJCSR)
Research Article | Volume 1, Issue 1 | Pages 11-14 | ISSN XXXX-XXXX

Test Case Prioritization on Regression Testing by Using FTV

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ABSTRACT- Software has a vital role in the software life Testing is a technique to detect the error, bugs ensure to make the software reliable. Regression testing is performed when module, unit or component is modified in order to change the functionality or for some other reasons. In this paper an emerging approach is used for prioritization of test cases. Test case prioritization is considered when the important test cases give higher priority to be executed firstly than other test cases executed. This work is focuses on the analyses of different prioritization techniques, to elevate the rate of detection of faults, to decrease the time of testing process. Furthermore, for the prioritization of test cases are being calculated by the function values affected. Thus, to overcome these issues we will propose an algorithm which will provide efficient and effective results.

Keywords: Regression Testing, Test Case Prioritization, Function Value, Genetic Algorithm.

ARTICLE INFORMATION

Author(s): Pratibha and Ishdeep Singla;
Received: 07/03/2022; **Accepted**: 12/04/2022; **Published**: 15/07/2021;
e-ISSN: XXXX-XXXX;
Paper Id: IJCSR-010103;
Citation: 10.37391/IJCSR.010103

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1. INTRODUCTION

Software Engineering is concerned with computer science which applies engineering principles to create, operate, modify and maintain of software components. Software engineering is discipline to develop, evolve and maintaining software. Software engineering has a huge role to solve the problem skills, approaches, technology and methods applied on the domains to evolve and create useful systems. Software engineer has a solution to solve many problems like practical problems. An organized and systematic approaches, tools, methods are adopted by software engineers to solve the problems. Software engineering is concern with development, quality and testing and control of the system.

Software testing is a process to identify error, bugs or faults in a system to make it reliable, correctness, completeness and quality of developed software. The main focus of software testing is to fulfill user's requirements and make the software reliable and free form errors. So, software testing is to find outs the error or bugs to improve the quality of the system. It whether the expected results match with the actual results**.** It is the last phase of the SDLC before deployment phase. Software testing has many technologies are concerned with black box and white box.

Regression testing is a testing of program with the test cycle to make sure that changes do not affect to functions that are not supposed to be affected. This verification of the modified software in the maintenance phase is known as Regression testing. Software testing has bad impact on time and budget constraints. Regression testing is the re-execution of the software function artifacts. Regression testing is a process of software testing that seeks to untested new software defects, errors in existing functional and non- functional areas of a software after modification i.e. enhancement or modification changes have been made. Regression testing is a normal part of the program development process and, in larger companies, is done by professional software tester. Software test script writers create the test scenarios and exercises that will test new unit of code after they have been written. These test cases from what becomes the test suite. Before the deployment of the new version automatically the old version is run against the new version. The reason they might not work is because changing or adding new code to a program can easily introduce errors into that is not intended to be changed. Regression testing must be applied on system, unit and integration.

Test Case Prioritization is considered when we need most important test cases having higher priority to be run earlier than the other test cases to be run. Test case prioritization decreases the time of testing process and generate highly efficient test cases. Prioritization of test cases in the order of execution in a test suite can be beneficial.

Table 1: TCP Techniques of Regression Testing

S.NO	TCP TECHNIQUES
1	*No Prioritization:* There is no test case prioritization is applied in the test suits.
2	*Random Prioritization*: In this randomly test cases are considered.
3	*Code-coverage based prioritization*: It covers all maximum functions, classes or code fragments of software program within limited time period have highest priority in the prioritize test suit. If multiple test cases cover the same number of functions, then randomly test cases are considered.

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4	*Optimal Prioritization*: In this technique, the most faults included test cases are executed first.
5	*Mutation based Prioritization*: It is relies on the fault based approach. A mutant of statement is generated by randomly changing the statement.

Test case prioritization is considered when there is a need of test cases to become at higher priority to run the other test cases. To prioritize the test cases are useful for the software quality and productivity.

Test case prioritization (TCP) techniques, in test cases are organized in the test suits for effectiveness. Test case prioritization is an important part of regression testing technique, which approaches typically and configure existing test case for regression testing accordingly to achieve targets.

1.1 Types of Regression Testing
There are two types of regression testing:

1. Correction Regression Testing: when specifications are unchanged and test case cannot be used.
2. Progressive Regression testing: when specifications are changed and new test cases must be prioritized.

The regression testing is applied directly to the change of the code. Regression testing is concerned with the maintenance phase.

1.2 Structural Techniques of Priority Dependency

1. Open Dependency Structure: In this structure, higher priority test case should be executed firstly after that other test case should be executed anywhere in the program.

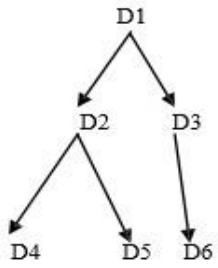

Figure 1: Open Dependency Structure

2. Closed Dependency Structure: In this structure, higher priority test case should be executed just before the other test case executed means the other test case follow the first test case. Test case prioritization will also decrease the time consumption and will lead to early detection of faults or we can say the processing of one test case must be halted till the test case on which it is dependent will get executed. Only after test case will take place its execution will be initiated.

There are two types of test cases:

(i) Independent test cases: These test cases can be executed without taking into the concerns of another test case's completion into account. Means they can be executed freely as no any test case needed to be finish before them.
(ii) Dependent test cases: These test cases can't be executed without taking into the account another test case's execution as they are dependent on it. Means they can't execute freely because one or more test cases needed to be finish before them.

Organization: This paper describe as Section II as Historical Review, Section III as Proposed Work, Section IV as Performance Evaluation.

2. HISTORICAL REVIEW

Test case prioritization is considered when the important test cases gives higher priority to be executed firstly than other test cases executed. In this approach error can be found. The problem is lack of resources can be resolved. Priority of test cases are not assigned randomly but assigned according to rule. And test case run according to priority.

Stuart C. Reid discussed [1] about the experiment which is comparable to EVP, BVA and described about the effectiveness based upon the 20,000 lines of ADA code. They considered all the inputs value that satisfy and all the input values that cause fail of module and comparison for them and find out probability of detection. The experimental result for EVP is more effective than the BVA. BVA was the most effective technique studied, achieving a highest mean probability of detection of 0.79, compared with 0.33 for EP.

Gregg Rothaermel [2] described several techniques for prioritizing test cases for regression testing and empirically examined their relative abilities to improve quickly faults can be detected during regression testing. His results show that these techniques can improve the rate of fault detection of test suites and that occurs with least expensive techniques. They used to code-coverage-based techniques which provides immediate practical implications.

W. Eric Wong et al. [3] Proposed a hybrid technique. Which combines modifications, minimization and prioritization based selection using a list of source the execution is taken on software previous version. Their test identifies the subset of all test cases that may result in different output behavior on the new software. They have report the select regression tests number of test cases which not grow large software develop.

Gregory T. Daich [4] discussed about the road map of software testing and their sub categories. He explained how to execute, the prioritized test cases. They use graphical user interface of the software. On the bases of the present techniques the new techniques will proposed.

G.Duggal et al [5] presented the various types of regression testing techniques and their classification presented by various researchers. The explanation of selective and prioritizing test cases for regression testing is defined. Also discuss about

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search algorithm which is my key idea. In this paper tried to explain the complete structure of regression testing to make researcher understand its importance and scope. Regression test selection is divided into three categories and explains them. Test case prioritization problem and technique is explained. Then discussed about the search algorithm of different types their approaches and challenges.

Huaizhong Li and C. Peng Lam [6] discussed the test generation using and colony optimization. A test case which is properly generated may not find good quality faults but reduce the cost of the system. It is required that the test suit generate automatically test cases to achieve required test coverage. In this paper we generated test cases using ant colony optimization using state testing. To represent state chart model representation a directed dynamic graph is created. To achieve requirement of test coverage, optimal test data are generated.

Dr. Arvinder Kaur et al. [7] Taken the example of Ride matching problem by Bee colony optimization. Participants in ride sharing also save money, reduce stress and reduce travel time since they can use lanes. In ride-matching systems, commuters wishing to participate in ride sharing are matched by where they live and work and by their work schedule. They have made an attempt to develop the methodology to be able to solve the ride-matching problem. They proposed methodology which was based on the concepts of collective intelligence. The proposed BCO Meta heuristic was sufficiently general and could be applied to various combinatorial optimization problems.

Irena, J [8] discussed the two types of software testing technique which are white box and black box. These categories are further divided into subcategories like code coverage testing, decision tree testing, boundary testing etc. The goal of testing and comparison between two techniques with diagrammatic representation is also mentioned in this paper. Then about the software quality assurance is also mentioned in the paper. The responsibilities of the testing are also explained in the paper. The comparison between agile versus traditional, exploratory versus scripted, manual versus software is explain in the last section of the paper.

Corina S. Pasareanu et al. [9] introduced the new research trends in symbolic evaluation, how to prioritized the test cases. Firstly, described a step to handle the complex programming constructs. And they depicted the existing hybrid techniques for the inherent limitation for handling assembly code. Finally, survey of pre-symptomatic testing also mentioned. Some new techniques that handle the traditional techniques and give beneficial result for the future are also discussed.

From the literature survey, regression testing has a vital role in the software field. But it causes some problems during the execution of the test cases for their prioritization According to Mrs Bhatri Suri [5], the prioritization of test cases in a regression testing is a biggest task. Gregg Rothermel [2] described the factors affected by the regression testing included with time and cost constraints

3. PROPOSED WORK

Test Case Prioritization in regression testing by using function test value. Function value is described the number of function encounter by total number of functions being affected.

3.1 Problem Formulation

Research in software testing has experienced a significant growth in decade years. Regression testing is re- execution of the functions to verify the modified version of the system. A function has an input, an action performs and an expected outcomes as an output. The main focus of functions is to find out defects. A test case can contain knowledge that includes the test case name, objective, background, steps to take, input and expected results. To check whether the application is working according to the given specification then its expected results are matched with the actual results. There are many techniques which are developed to define the test cases. There are many different kinds of Test Case Prioritization i.e. Exposing faults based or timing based depends upon the need. It gives higher priority to least important function and l o w priority to most important function. Function (Test case) can be prioritizing on the basis of function encounter, time and its need. Test case prioritization schedules the test cases in a regression test suite with a view to maximizing certain to find faults which help reduce the time and cost required to maintain service-oriented business processes. As it described above test cases are prioritize on the basis of time and defects. But sometimes a particular test case gives 1st priority to that function which is least important on the basis of either faults finding or timing constraints and gives last priority to that which is most important. So, in this way important functions are avoided and do not give valuable results as required. So to overcome this problem a new methodology is proposed which will be focus on the importance of the function not the importance of the test cases. By doing this the important function's test case will be execute first then others function's test cases.

3.2 Proposed Approach

The test case prioritization is proposed in this paper which was implemented in the platform of java (Net Beans 8.0). This proposed approach based on Test Case Prioritization on regression testing by using function test value. In which higher priority is given to least important function and low priority is for most important function. As the below figure depicts the scenarios which are considered.

As with explanation, maintain a database which contains all related information of the project i.e. project id, project name, functions perform and no. of changes functions being affected due to changes. Match new projects with database and find out that functions which are affected due to changes in the functionality. Evaluate function value of each function according to the formula of function value. Traverse an activity diagram (UML Model) to find out the function dependency. Find out the Function Test Value by adding value of each Function Value. Prioritize of test cases according to the ascending or descending order of each test case

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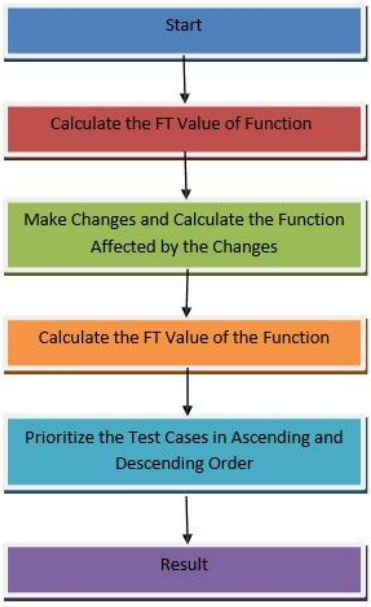

Figure 2: Flow Chart of Proposed Technique

Formula Used:

$$\text{Function Value} = \frac{\text{Number of function encounter}}{\text{Total number of function being affected}}$$

From, this formula the function values are being taken. And it resultant as for the test case prioritization will be supposed by the affected function values.

4. PERFORMANCE ANALYSIS

At the end test cases are arranges according to any order either ascending or descending order.

Figure 3: Test Case Prioritization

As the above *figure 3*, shows the prioritization of test cases with respect to the functions values. Regression testing increases our chances of detecting bugs caused by changes to a software and application- either enhancements or bug fixes. Also remember one thing we don't give any sort of guarantee that for performing regression testing here are never any sorts of side effects also. Regression testing also finds the undesirable side caused during the changing in the operating system.

5. CONCLUSION

Re-execution of the software function, test cases in a maintenance phase for testing the modified structure called Regression testing. Cost and schedule constraints are the major cause. To remove this problem new technique is required for better productivity and reliability. In the existing work test cases are prioritized on the basis of number of function encounter and total number of functions being affected. This process has problem in which higher priority is given to least important function and low priority is given to most important functions. So, to overcome this problem a new technique will propose which provides priority to the functions.

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