# Novel Technique for the Test Case Prioritization in Regression Testing

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***Abstract -*** The process of verifying the modified software in the maintenance phase is known as Regression 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 mutation value is calculated from which the best fitness value is calculated which will be the importance of the particular function. To test the performance of proposed and existing algorithm MATLAB is being used by considering the dataset of ten projects. It is analyzed that proposed algorithm performs well in terms of percentage of fault detection and execution time

***Keywords -*** *Regression Testing, Manual Slicing, Bio-inspired*

## I.    INTRODUCTION

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. The software contains the operating system and some more utilities like disk formatting, file managers, display managers, etc.  The application software used for accomplished the specific tasks. Application software may or may not contain the single program. Software is the program or set of programs. It is different from the program in many ways [1]. As in software many things are includes: as it consists of the programs, the complete documentation of that program, the procedure that is use to set up the software and the various operation of the software system. Any program is the subset of the software. As software requirement is increases day by day. So it is necessary to maintain the good quality software. 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 [2]. 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. The customer can be satisfied in terms of quality, cost and design of the system software. Many developers adopt the techniques like systematic and organized approach to develop software. A software development process is use to translate the software product, in which the customer translate all the needs to the developers that what kind of changes a customer required [3]. A test case is set of procedure use to test the software. Test case is a set of condition under which 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 goal of testing are fulfill. If the goal is fault detection then an improper execution order might reveal most of fault late which leads to delay in bug fixing activity and the delivery of software [4]. 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 [5]. It is an expensive testing process used to detect regression faults.  Genetic Algorithm originated from the studies of cellular automata. It is conducted by John Holland and his colleagues.  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. It used to improve it through repetitive application. In this case it involves many applications such as: mutation, crossover, and selection operators. Many Researchers have adopted genetic algorithms as a solution to optimization in various fields [6]. The genetic algorithms acts as a solution to optimization problem started gaining popularity towards the end of the last century as used to solve optimization problems in construction. Its intrinsic parallelism facilitates the uses of distributed processing machines, like Distribution Network Planning. Problems which appear to be particularly appropriate for solution by GA include Scheduling and State Assignment Problem. GA approach to Solve Map Colour Problem has been examined also.

## II.  LITERATURE REVIEW

**Bharti Suri et.al (2012)** have proposed in this paper [7], 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.

**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 [8]. 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 most beneficial are executed first. 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.

**Swarnendu Biswas et.al (2010)** explained in this paper [9], that Regression testing is an important and expensive activity that is undertaken every time a program is modified to ensure that the modifications do not introduce new bugs into previously validated code. An important research problem, in this context, is the selection of a relevant subset of test cases from the initial test suite that would minimize both the regression testing time and effort without sacrificing the thoroughness of regression testing. Researchers have proposed a number of regression test selection techniques for different programming paradigms such as procedural, object-oriented, component-based, database, aspect, and web applications. In this paper, we review the important regression test selection techniques proposed for various categories of programs and identify the emerging trends.

**Dr.Varun Kumar et.al (2010)** proposed a new approach which considers the severity of faults based on requirement prioritization [10]. Main aim is to find the severe faults near the beginning in the testing process and hence to improve the quality of the software according to customer point of view. Results indicate that our prioritization approach frequently finds outs faults with high severity. Analysis is done for the prioritized and non prioritized cases using WPFD metrics. An algorithm is also proposed to increases regression testing quality. Graphs proved effectiveness of prioritized suites than others. The main concern is to improve effectiveness of regression testing with prioritization.

**Mohd. Ehmer Khan (2010)** presented various software testing techniques [11]. The main aim of testing is to perform finding errors using different types of approaches. The major difficulty is to find out the solution which should be applied to find errors. In this paper different testing techniques are explained. Correctness testing is used to find out right behavior of the system and combined the white box and black box testing features. Performance testing explain about the plan, strategy, execution and reporting. It further divided into load and stress testing. Reliability testing is used to remove the bugs before the release of the product and explain about the security testing.

**Sahil Batra et.al (2011)** have mentioned about the different types of the software testing techniques and their strategies to improve the quality of the software. In this paper [12], a variety of types of software testing technique and their different attributes of software quality are explained. The aim is to identify the types of testing that can be applied for checking a particular quality attribute. All types of testing cannot be useful in all phases of software development life cycle. Also summarized which types of testing are applicable in which phases of life cycle of software development. General SDLC processes are applied to different type of

projects under different conditions and requirements. The different between debugging and testing is also explained. Then how to improve the quality of the software using which matrices are explained. The experimental results and their overall performance graphs are shown.

### III. RESEARCH METHODOLOGY

The Regression testing is the testing which is applied to test the software when some changes are done in the already developed project. The test case prioritization is the technique of regression testing which prioritizes the test cases according to the changes which are done in the developed project. This work is based on automated and manual test case prioritization techniques. In the existing technique the manual test case prioritization is been implemented to detect faults from the project. In the manual test case prioritization two parameters are considered which are, number of times function encountered and number of functions associated with the particular function. 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 maximum at that point the mutation value is calculated as the best mutation value of the function. The function mutation value will be the function importance from where the test cases are prioritized according to the defined changes. 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.
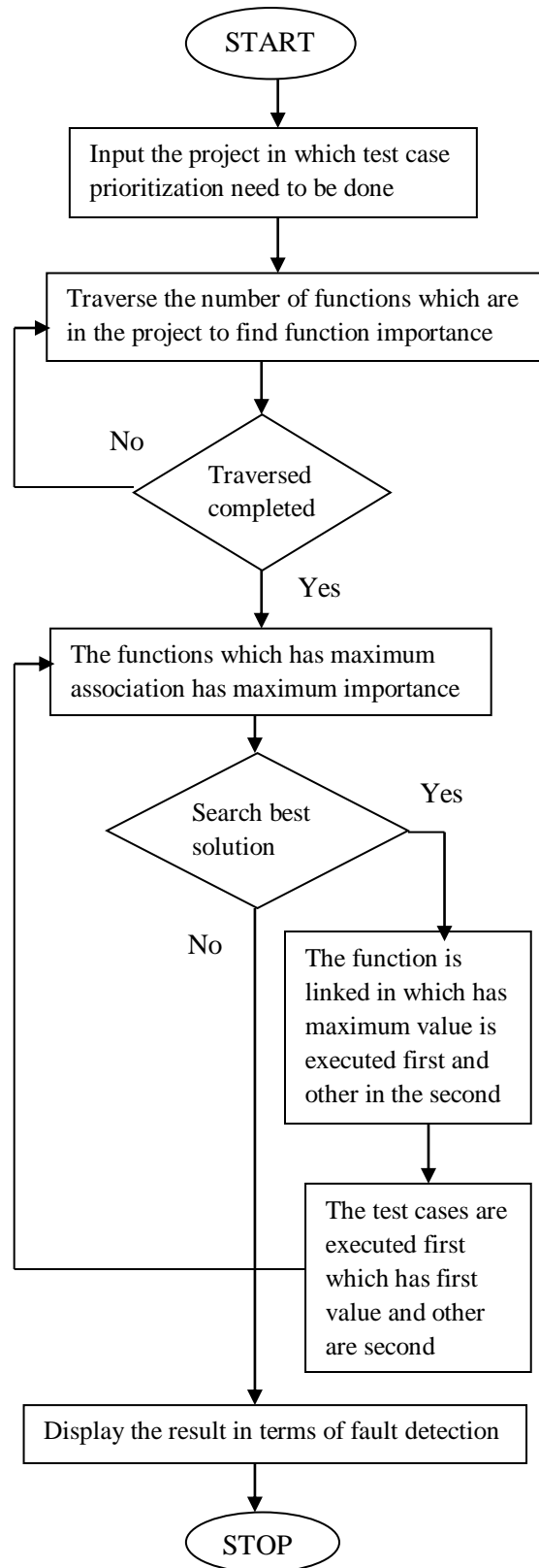
**Proposed Algorithm**

Input: Test cases=P(i)
Number clicks on each function =F(i)
Output: prioritized testcases
I<-Consider value of F(i) for the each test case
Test case F(i) value <- i
while ( fault value of each test case is calculated )
    a=F(i)
    calculate number of links L(i)=F(i)'/F(i)
        if(L(i)>L(i+1)
        b=L(i)
    else
        b=L(i) end
Calculate fault value
Fault (i+1)=fault(i)/L(i)
        if Fault(i) > Fault(i+1)

best_so_far <-Fault(i)
i <- generate an individual randomly end

## IV.      EXPERIMENTAL RESULTS

The proposed algorithm and existing algorithms are implemented in MATLAB for the ten project and in each project 10 to 15 test cases are considered. The fault detection rate is increased and execution time is reduced as illustrated the figures shown below
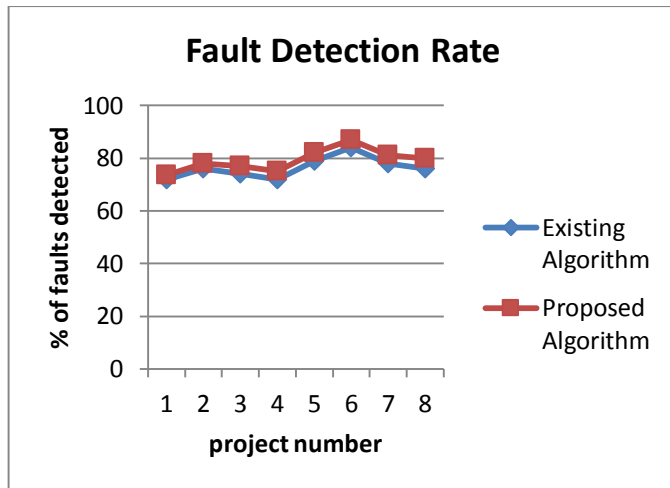


Fig 2: Fault Detection Rate

As shown in figure 1, the proposed algorithm and existing algorithm are compared in terms of fault detection rate. It has been analyzed proposed algorithm performs well in terms of fault detection rate.
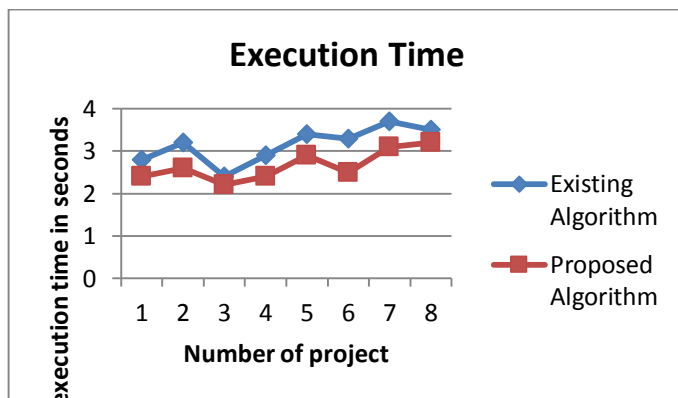


Fig 3: Execution Time

As shown in figure 3, the execution time of the proposed algorithm is less as compared to the existing algorithm.

## 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 is being applied to implement the test case prioritization in the automated manner. 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.

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