Efficient test case prioritization using evolutionary algorithms

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Abstract: *Software testing is not a single objective task. There are other objectives that may involved in the testing process, such as time and cost. The motivation for the optimization is that most of the cases, testers do not have enough time and resources to achieve testing extensively. Hence, we trying to select a minimum number of test cases and at the same time achieve high level of coverage. The term of efficiency in this paper, represent the following: finding more faults and increasing the rate of fault detection (i.e. a measure of how quickly faults are detected). In this paper, a new genetic algorithm is introduced that will prioritize regression test suite within a time constrained environment on the basis of total fault coverage .It is better for testers to detect the first fault after half an hour of testing than waiting five hours. Hence, in which order these test cases are executed is very important for the testers in this context. The previous objectives and parameters play a significant role in this paper, since they are the inputs to the fitness function of evolutionary algorithms.*
Keywords: *Genetic Algorithm, Regression, Faults, Test Case Testing .*

I. INTRODUCTION

The quality and reliability of software are significance aspects and they have become strategic factors for software development companies. There are many techniques of software verification and validation. These techniques include the following: reviews, walk troughs, software inspections, formal methods and software testing. Software testing is the process of executing a program or application with the intent of finding the software defects [1]. Software testing costs too much and takes too long. Testing is a complex and default task. It consumes almost 50% of the cost of a software development project [2]. Generating and running the test cases of software is a very consuming timing task. For instance, Rothermel et al. [3] stated that running all the test cases of an industrial application of about 20,000 lines of code takes seven weeks.

Generating test data manually is time consuming. Hence, several techniques have been proposed to generate and handle these data automatically. Evolutionary testing is one of these techniques. egression testing is very important stage of software maintenance and evolution phase[4]

Evolutionary testing is a methodology for producing high quality test data automatically [5]. Evolutionary algorithms have been applied in many areas to solve real life problems. Genetic algorithms (GA) are well known form of the evolutionary algorithms conceived by John Holland in United States during late sixties [6]. GA is a practical and robust technique and search method. Test case prioritization is the technique of regression testing to reduce the time and effort required for regression testing[7] . GA is a search algorithm inspired by the way nature evolves species using natural selection of the test individuals. The possible solutions to the problem are represented by a set of chromosomes. Chromosome is a string of binary digits. Each digit called a gene. The initial population can be created randomly. GA uses three operators on its population which are selection, crossover, and mutation.

II. GENETIC ALGORITHM

genetic algorithms is a search technique often used in computer science to find complex, non-obvious solutions to algorithmic optimization and search problems, Then, proposes a test case prioritization method based on genetic algorithm, whose representation, selection, crossover and mutation are designed for testing the main operators of GA are selection, crossover, and mutation .

The individuals who succeed produce more offspring and genes propagate to the subsequent generations. the conducted experiments considered various criteria combinations (faults, costs, and number of test cases)[8] ,The chromosomes of parents mate together by exchanging the genes to produce offspring, which have better fitness than the parents, Before applying GA to any problems whole units are divided into a small unit that is called genes[9]. This process keeps on going for generations to form better individuals of the species to adapt to the environment. the algorithm evolves the through three operators:
a) Selection Operator
b) Crossover Operator
c) Mutation Operator

III. LITERATURE REVIE.

Testing is a repeated task with multi-objectives. Some of these objectives may contradict with each other. For example, I want to select a minimum set of test cases in order to reduce the cost of testing and at the same time I want to increase the coverage of testing in order to make sure that my application works as it supposed to be. For this purpose, several approaches have been proposed to solve this dilemma [6]. Yoo et al. [6] stated approaches to achieve the efficiency of testing by selecting a set of test cases that have higher likely to detect defects. They also present some techniques have been used to minimize these test cases. The main goal of minimization is that the testers at the most cases have only a limited time to achieve testing. The time is a significant factor in testing, and testing maybe executed more than one time (i.e., regression testing). Hence, the testers try to reduce the time to detect the first defect. For this purpose, several techniques have been proposed to prioritize test cases [10]. The main goal of these techniques is to start testing with test cases that detect defects as soon as possible. Zhai et al. [11] stated that these prioritization techniques increase the efficiency of testing by increasing the early rate of defect detection which will lead at the end to decrease the time of testing.

IV. PROBLEM STATEMENT

Regression testing is the essential process of software maintenance and evolution phase of the software development**,** Test case prioritization is the technique of regression testing to reduce the time and effort required for regression testing**.** There are other objectives that may involve in the testing process, such as time and cost**,** we trying to optimize the task process by increasing the efficiency of testing **.**

V.OBJECTIV

In the research scenario**,** Various methods and techniques have been used in this regard to obtain the best optimal test suite for Regression Testing**,** which covers all the faults with time constraints .
(i) To select and prioritize regression test suite within a time constrained environment .
(ii) to ensure the bugs are fixed and the new functionality that are incorporated in a new version of a software do not unfavorably affect the correct functionality of the previous version..
(iii) To implement efficient Genetic Algorithm (GA) for test cases that will cover major faults in minimum time.
(iv) ensure the validity of the altered software.

VI. PROPOSED METHODOLOG

For implement the genetic algorithm, the proper method need to be followed for generate the results. The steps are:
(i) Study of existing Genetic Algorithm.
(ii) Research on working of Genetic Algorithm Steps.
(iii) Flow Development of new research and its Implementation in programming Language.
(iv) Analysis of results.
(v) Analysis the benefits of Genetic Algorithm.
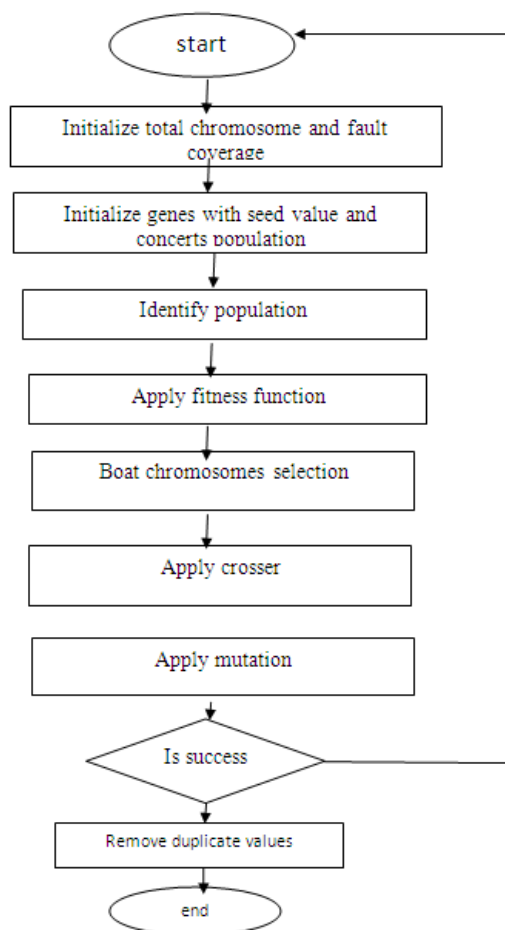
Fig 1 Genetic Algorithm for Efficient Test Case Prioritization

VI. CONCLUSION AND FUTURE WORK

In this paper, we have been proposed the genetic algorithm and methods which can be used for efficient test cases prioritization. Test case prioritization aims at ordering test cases to increase the fault detection capability.so his paper introduces new prioritization techniques, which are based on fault prediction in acceptance testing. The performance of the proposed approach in terms of fault detection is evaluated with the help of many programs. The proposed is not implemented in this paper.The implementation part will be covered in the next paper, which will demonstrate the real working of proposed algorithm.

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