

Designing Test Cases Optimization Using Genetic Algorithm

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Abstract:- Every software product is likely to meet particular needs. When product is starting to develop it need to check whether it satisfy the user needs. Software Testing is that task of validation and verification of product to supply the quality and efficiency. Regression testing is that the approach of substantiating the modified coding system to note errors that area unit introduced into previously tested code. The take a glance at cases got to be generated as a result of the pc code is modified and size of take a glance at suites conjointly can increase. The prioritization improves the effectiveness of regression take a glance. Total fault coverage with in time affected setting on altogether completely different examples is utilized for prioritization of take a glance at cases and their finite answer is obtained. Through Genetic rule technique, Associate in Nursing approach has been famous to go looking out a suitable population, that was a lot of developed by GA operations to create it plenty of versatile and economical.

I. Introduction

1.1 Testing

Testing is that the strategy of evaluating a system or its component with the intent to go looking out that whether or not or not it satisfies the required desires or not, means, to sight the variations between existing and required conditions. Testing is penalty a system thus on spot any gaps, errors or missing desires in contrary to the actual would like or desires. Package testing validates and verifies the package program. The errors unit to be identified thus on mends those errors. The foremost objective of package testing is to stay up and deliver a prime quality product to the consumer. Each package is anticipated to satisfy positive desires.

1.2 Techniques of Testing

The testing can be implemented by different techniques. Depends upon the requirement, the different techniques will be applicable. The two major approaches of software testing are manual software testing and automated software testing. Manual software testing has different stages. The following are the stages:

- i. Unit testing
- ii. Integration testing
- iii. System testing
- iv. User acceptance testing.

Different techniques are used for software techniques. The automated software testing techniques are the following:

- i. White box testing
- ii. Black box testing
- iii. Grey box testing.

White box software testing is the testing of the working of the software and its internal structures. It can detect errors of the implemented parts, but the unimplemented parts go

undetected. Black box testing is the testing of the functionality of the software as opposed to its internal structure. It can be done at all levels of software testing. Grey box software testing it is the combination of white box as well as black box testing. These techniques have been elaborated in the next topics.

1.3 Regression Testing

Regression means that the act of going back to a previous place or state. Regression testing could be a variety of package testing that intends to make sure those changes means that enhancements or defect fixes to the package haven't adversely affected it. Whenever a amendment in a very package application is formed it's quite doable that different areas inside the appliance are stricken by this alteration. To verify that a set bug hasn't resulted in another practicality or business rule violation is Regression testing. The intent of Regression testing is to make sure that a amendment, like a bug fix failed to lead to another fault being uncovered within the application. It can even be outlined as re-testing associate degree application when its code has been changed to verify that it still functions properly. Regression take a look acting consists of re-running existing test cases and checking that code changes failed to break any antecedently operating functions, unwittingly introduce errors or cause earlier fastened problems to re-emerge. These take a look at cases ought to be run as usually as doable with an automatic regression testing tool, in order that code modifications that harm however the appliance works are often quickly known and glued. There are necessary points for regression take a look at suite.

1.3.1 Understand Business Area

This includes working with business partners and stakeholders to ensure each subset of the business area supported is documented and tracked by the team. Leverage subject matter experts (SMEs) from not only the testing organization, but also the business and development teams.

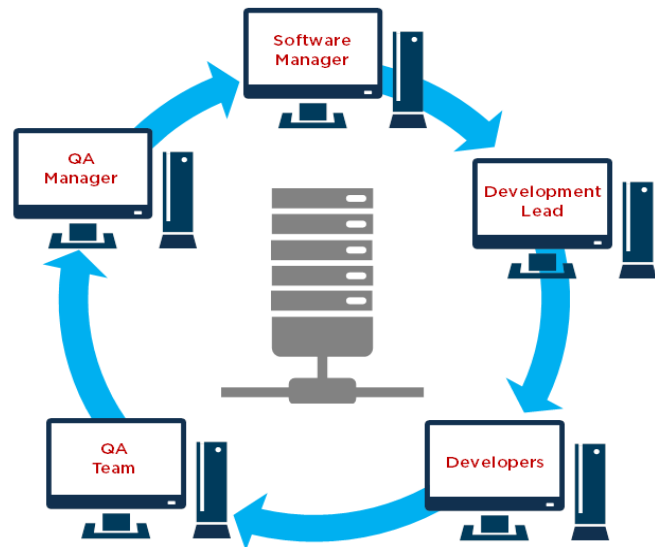


Figure 1: Regression Testing in Development

1.3.2 Create, validate and maintain the artifacts

In this step, basically documenting various integration points and subsets of business areas is not the only goal. It is important that, as new releases, updates and changes are rolled out, the suite is revisited and artifacts are updated to maintain the accurate and detailed picture of the business area.

1.3.3 Understand the test cases required to build high coverage for the business area

It is important that review this with the business stakeholders, development and testing teams to ensure agreement and collaboration between the teams. Creating

test cases builds the framework for future savings as the test cases are created once in order to be used many times down the road.

1.3.4 Build the test suite in priority order

Teams are able to quickly define which subsets of a business area are the most critical to the organization. Based on this prioritization, the test suites must be built in this order. After a regression test suite is built, teams may find not all regression test cases can be run at times, and a risk based approach must be followed. When this occurs, regression prioritization should be based on the importance of the test cases and whether these cases can detect and identify possible defects in the product.

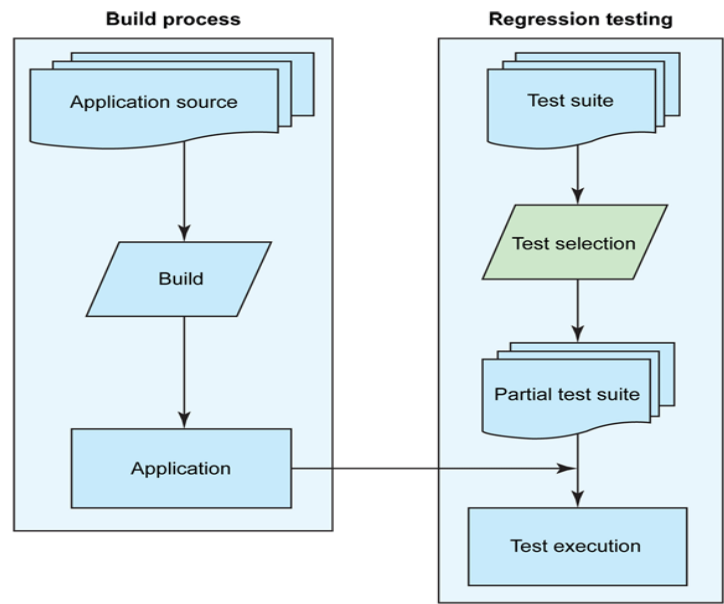


Figure 2: Regression testing without degrading test coverage

This presents a safe and efficient test selection technique that relies on profile data to select test cases.

1.4 Genetic Algorithm

Genetic Algorithm (GA) is adaptive heuristic search algorithm premised on the evolutionary ideas of natural selection and genetic. The basic concept of GA is designed to simulate processes in natural system necessary for evolution. As such they represent an intelligent exploitation

of a random search within a defined search space to solve a problem. To use a genetic algorithm, there is need to represent a solution to our problem as a genome (or chromosome). The genetic algorithm then creates a population of solutions and applies genetic operators such as mutation and crossover to evolve the solutions in order to find the best one. After an initial population is randomly generated, the algorithm evolves the through three operators:

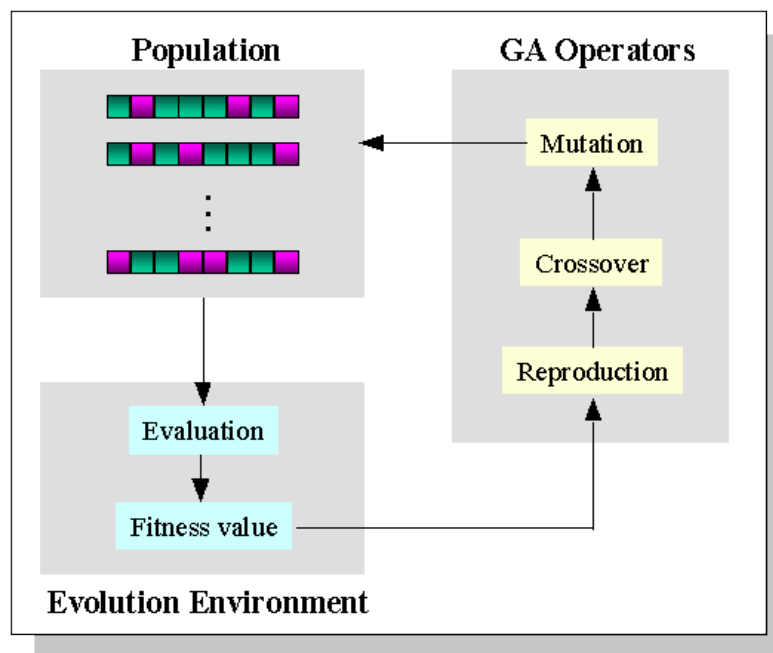


Figure 3: Genetic Algorithm Overview

1.4.1 Selection Operator

It equates to survival of the fittest. This gives preference to better individuals, allowing them to pass on their genes to the next generation. The goodness of each individual depends on its fitness. Fitness may be determined by an objective function or by a subjective judgment.

1.4.2 Crossover Operator

Prime distinguished factor of GA from other optimization techniques. In this, two individuals are chosen from the population using the selection operator. A crossover site along the bit strings is randomly chosen. The values of the two strings are exchanged up to this point. If $S1=000000$ and $S2=111111$ and the crossover point is 2 then $S1'=110000$ and $S2'=001111$

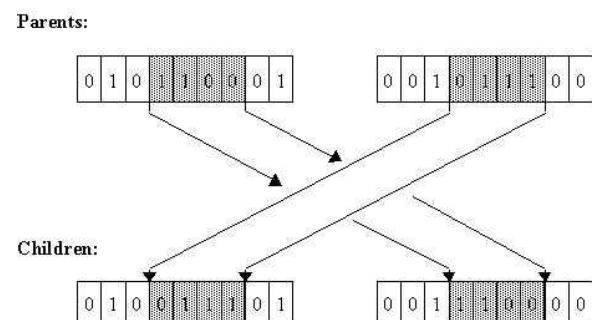


Figure 4: Crossover in Genetic Algorithm

The two new offspring created from this mating are put into the next generation of the population. By recombining portions of good individuals, this process is likely to create even better individuals.

1.5 Genetic Algorithm Advantages

- i. GAs deal directly with a population of solutions at any one time. These are spread throughout the

- solution space, so the chance of reaching the global optimum is increased significantly.
- ii. Each solution consists of a set of discrete pipe sizes. One does not have to round diameters up or down to obtain the final solution.
 - iii. It can solve every optimization problem which can be described with the chromosome encoding.
 - iv. It solves problems with multiple solutions.
 - v. Structural genetic algorithm gives us the possibility to solve the solution structure and solution parameter problems at the same time by means of genetic algorithm.
 - vi. Genetic algorithms are easily transferred to existing simulations and models.

II. LITERATURE SURVEY

Gregg Rothermel et al [1] (2001), "Prioritizing check Cases For Regression Testing", IEEE TRANSACTIONS ON computer code ENGINEERING, VOL. 27, NO. 10.

Test case prioritization techniques schedule check cases for execution in associate order that makes an attempt to extend their effectiveness at meeting some performance goal. Numerous goals area unit possible; one involves rate of fault detection. The live of however quickly faults area unit detected among the testing method. Associate improved rate of fault detection throughout checking will give quicker feedback on the system underneath test and let computer code engineers begin correcting fault previous would possibly somewhat be potential. One application of prioritization techniques involves regression testing the retesting of computer code following modifications; during this context, prioritization techniques will make the most of knowledge gathered regarding the previous execution of actions to get check case orderings. during this work, they describe many techniques for exploitation check execution data to order check cases for regression testing, including: Zheng Li et al [2] (2007), "Search Algorithms for Regression action Prioritization", Transactions on computer code Engineering, Vol. 33, No.4.

Regression testing is a fashionable, however necessary, process. sadly, there could also be light resources to permit for the re-execution of all check cases throughout regression testing. during this state of affairs, action prioritization techniques aim to boost the effectiveness of regression checking by ordering the test cases in order that the foremost helpful area unit dead initial. Previous work on Regression action prioritization has centered on Greedy Algorithms. However, it's famous that these algorithms could turn out suboptimal results as a result of they'll construct results that denote solely native minima among the search house. against this, metaheuristic and organic process search algorithms aim to avoid such issues. Author presents results from associate empirical study of the appliance of many greedy, metaheuristic, and organic process search

algorithms to 6 programs, starting from 374 to eleven,148 lines of code for 3 decisions of fitness metric. The paper addresses the issues of selection of fitness metric, characterization of landscape modality, and determination of the foremost appropriate search technique to use.

R.Krishnamoorthi et al [3] (2009), "Regression check Suite Prioritization exploitation Genetic Algorithms", International Journal of Hybrid data Technology Vol.2, No.3.

Regression testing is a fashionable, however necessary method in computer code testing. sadly, there could also be light resources to permit for the re-execution of all check cases throughout regression testing. during this state of affairs, action prioritization techniques aim to boost the effectiveness of regression checking by ordering the test cases in order that the foremost helpful area unit dead initial. During this paper they planned a replacement action prioritization technique exploitation Genetic formula (GA). The planned technique prioritizes subsequences of the initial check suite in order that the new suite that is run among a time-constrained execution setting can have a superior rate of fault detection in comparison to rates of every which way prioritized check suites. This experiment analyzes the genetic formula with respect to effectiveness and time overhead by utilizing structurally-based criterion to order check cases. a mean proportion of Faults Detected (APFD) metric is employed to see the effectiveness of the new action orderings.

Arvinder Kaur et al [4] (2011), "A Genetic formula for Regression action Prioritization exploitation Code Coverage", Vol. 3 No. 5, IJCSE.

The author has been assimilated the information regarding Regression testing and therefore the techniques for implementation. Regression testing may be a testing technique that is employed to validate the changed computer code. The regression check suite is usually giant and wishes associate intelligent technique to decide on those check cases which can find most or all faults at the earliest. Several existing prioritization techniques prepare the check cases on the idea of code coverage with relation to older version of the changed computer code. In their approach, a replacement Genetic formula to order the Regression check suite has been introduced which will order check cases on the idea of complete code coverage

Wang Jun et al [5] (2011), "Test Case Prioritization Technique supported Genetic Algorithm", IEEE

With the fast development of knowledge technology, computer code testing, as a computer code quality assurance, is changing into additional and additional necessary. within the computer code life cycle, when the code has modified there has to be regression testing. the massive action library makes running a full action library being challenged. to the current finish, they designed a

genetic formula-based action prioritization formula and improved the genetic formula planned computer code action prioritization algorithm.

III. Purposed Work

In existing Approach and Research Papers, there is more variation in Paths and States of Deviation having the redundant data and less efficient in terms of time and accuracy. In testing Prioritization, tests cases got to be generated for investigation the errors in package but in regression testing, the modified package should be tested for distinctive the errors and to validate them. The worth of regression testing area unit progressing to be increased in terms of it slow. Therefore as per our literature survey we have finalized the next objectives.

The Research Work Approach is to implement the Testing on Different Test Cases with Faults Coverage, Time Optimization and test Cases Prioritization. In this Approach, the approach will be effective as need not to trace all the possible faults and need to cover considerable faults Test Cases and reduce the overheads on the algorithms.

3.1 Research Significant

The proposed work will lead to effectiveness of the Work and coverage of the most test cases with less complexity and within reduced time.

3.2 Research Methodology

To perform the research we believe that we should follow the following different steps need to consider for design the algorithm of prediction.

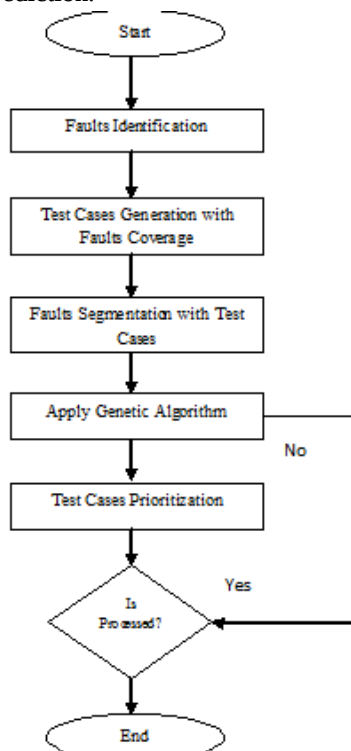


Figure 5: Flow Development

IV. Conclusion

The main aim of this research elaborated the purpose of research work and expected outcomes of the proposed Work. The aim of proposed work is to prioritize the test Cases with coverage of large faults. This research performs Faults Identification and generate the Test Cases and Identify Faults Segmentation with coverage of multiple Tests. The researcher Improve the effectiveness of regression testing by ordering the test cases for early execution of beneficial tests. The purposed study will help to study and apply Genetic Algorithm on the Test Suits and Faults and generate Results efficiently for coverage of most test cases.

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