



A NOVEL APPROACH TO SELECT, REDUCE, AND PRIORITIZATION REGRESSION TESTING USING HIBRIDE CRITERIA

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ABSTRACT: Regression testing may be a computer code testing technique. Testing and supportive the part of code square measure the activity performed at intervals completely different phases. Tasks of regression testing are action at law Prioritization, check Suite choice, and action at law reduction that offers the guarantee that no supposed fault is created whereas modifying the code. This paper hybrid all the criteria's in numerous prospective with existing techniques. Choosing and selecting aminimum range of check cases consistent with the result's our major goal. It'll offer ananswer to sure inessential results found when testing that additional appear to be diminished in execution time. In our work, we have a tendency to square measure formalizing the swarm algorithmic rule for hybrid criteria. Hybrid criteria use Rank, Merge, and selection for building the check cases from check suite for minimizing the redundancy. Branch technique is employed if one in every of check cases fails or doesn't show any result then next possibility may be used. Swarm algorithms offer further functions for having aneffective result with less time and energy. Initial seed worth for hybrid criteria's is taken at random. This analysis can result in offer higher potency in regression testing victimization hybrid criteria. Path Coverage deals with the action at law choice because it offers all the main points of check cases.

Keywords: Rank, Merge, Choice, Fault Detection

INTRODUCTION

Software engineering is Associate in nursing application deals with the event of computer code i.e. Analysis, Design, Implementation and Maintenance of computer code during a systematic manner. Development method involves with the necessity of the shopper, it initials maintain the list and style design. Computer code engineering was down 2 styles of Engineers: System Engineer: it's the method of planning the whole development. Pc Engineer: concerned computer code developer with thenice expertise of years.

Regression testing may be a maintenance a part of the computer code testing. Maintenance ensures enhancements when police investigation, deleting absolutely the error. Thus, it guarantee that changed an {part of} the program don't have an effect on the remaining updated part. It needs complete effort, attention, consumes time and is value effective. It effectively tests that newly changed code or new options additional square measure compatible with the prevailing code.

Minimization of your time and energy is completed by restarting the sole elect a part of code. Modification checks the compilation. The most goal is to pick out the minimum range of check cases and conjointly to decide on the chosen half to check instead of the whole. Researchers worked on varied approaches to regression testing i.e. action at law choice, check suite reduction, action at law prioritization. Criteria's employed by these approaches square measure code coverage modification of code. Code coverage is to ascertain thewhole program that each one the statements, branches, events, faults etc. square measure coated or not. A lot of the coverage of code lesser is that the potentialities to own errors.

Test case prioritization is for ordering check cases, that square measure done supported the priority to realize the goal. Check suite reduction is employed to cut back the redundancy because the redundancy consists of area coverage. Regression check choice is to pick out the smaller range of check cases for an outsized code, during which component part helps in modifying solely select portion.

Our main focus is to use the hybrid criteria's to extend the potency of a selected case. Varied algorithms and techniques square measure utilized in regression testing in individual approaches however the techniques utilized in hybrid approaches square measure hardly enforced in individual approaches. Most of theresearchers use the hybrid technique with sociologist improvement, HGS algorithms, and Pseudorandom range generation, warm and organic process algorithms square measure serving to algorithms during this testing.

LITERATURE REVIEW

SreedeviSampathet. al. In his work gave auniform illustration of hybrid criteria's. Hybrid criteria's they used is of assorted approaches Main goal of their analysis is to convey the uniform illustration of approaches. They came to grasp that check cases have various coverage. Factors on that they rely on square measure weight,



priority, and hybrid. The methodology employed by the scientist to indicate the effectiveness gave the expected results. This paper concludes that it's effective to have "Hybrid criteria" with beneath a 1 roof. (SreedeviSampath, Renee Bryce, & AtifM.Memon, 2013)

Jin bird genus et. al. this paper is predicated on real-time analysis to calculate once user interface regression is unsuccessful then UN agency is accountable or whom answerable. World testing Scripting testing is best suited. It checks 197 faults are available in the business in theuser interface. Faults detected were anincorrect fault, configuration, bugs etc. main goal is to repair the bugs by victimization X Tool and In style. The result shows out of 197 check cases a pair of bugs square measure found in InDesign and nine check cases aren't found anyplace within the code. Scientist assumes that it's resolved in execution surroundings. The script, Oracle, check Tools and Configuration square measure the causes for false positives. (JinChen, Mengxiang carver, Kai-yu, & Bing Zhao, 2012)

Mai Daftaret. al. projected their paper on regression testing in an automaticpseudo-random generation. During this check cases square measure elect consistent with the recent seed worth i.e. regression check choice approach. It tests this code modification by taking into the seed worth. This is often the paper that depends upon the user interface systems that aren't embedded. The main goal of this paper is to come up with correct check cases and to own the best framework to own quality. Algorithmic rule initial does initialization by this current state is achieved. During this paper "Rank" formulation is employed. Events square measure created so triggering method is additionally done. However the innovating algorithmic rule takes the delay time into the count and conjointly will verification. Tools that shows the potency is development kit and hardware machine tool. Factors on that they projected the paper is a share of potency, real-time response, failure recovery. (Mai Daftar& Mohamed Shalan, 2012)

GurinderSinghet. al. ensures the modification of the computer code effective by increasing the potency victimization GA and ACO algorithms. As we all know GA is theorganic process algorithmic rule and ACO may be a swarm algorithmic rule. A scientist works on the previous work so advocate new projected technique by victimization check suite, they choose the action at law at random initial so place different check cases in their path. Initialization is by half the ants and different ants then share the knowledge whereas new check cases square measure placed in their ways. This analysis concludes their report by giving the effective algorithmic rule by reducing the time. (GurinderSingh& Dinesh Gupta, 2013)

Related WORK

• Existing System

In the existing system, action at law prioritization and choice area unit used separately with single criteria. Regression testing mistreatment hybrid criteria's isn't however finished effective results. As in package systems, package takes a look after should take a look at therange of test cases at a time. Take a look at cases may be quite thousand. Therefore, it becomes tough {to take a look at to check} all the test cases at intervals short interval of your time amount. In previous work no such effective results area unit found within the field of regression testing by mistreatment hybrid criteria's, which might facilitate testing with themost outcome. Several time and efforts area unit taken by the present system to check multiple criteria's at a time. As we all know regression take a look acting is to check therange of test cases by mistreatment the criteria's separately, that successively consumes time and efforts. Mistreatment collective approaches with the assistance of hymenopteran colony we have a tendency to area unit creating the result more practical.

Ant colony optimization isn't want to have events, statements, and branches at intervals one technique within the existing systems. Examining the connection of multiple criteria to completely different completely different} techniques on application with different characteristics remains not been done. (SreedeviSampath, Renee Bryce, & AtifM.Memon, 2013)

• Proposed Approach

In our planned approach, hymenopteran Colony optimization is employed for regression prioritization and choice however mistreatment events, statements, branches and execution time in one technique is our needed planned work. In our work, themain task is to hidethe most range of taking a look at cases. However Ant's add their space to look for a food is given as follows:

1. The first demand is to visualize therange of events coated, which might be selected by Ants when selecting the take a look at cases willy-nilly. It tells what and the way the documentation is doing.
2. After having events we'd like to visualize the statements whether or not all area unit coated or not. Statement coverage depends on the rank made by ordering the criteria's. Every criterion has its own blessings therefore, one couldn't be full of through another. When ranking, merging technique is



employed that helps in having all criteria's in one packet in order that they will work jointly. Hymenopteran Colony optimization helps to merge all the statements.

3. Branch criteria area unit to hide all the conditions below the statements and merge them to own coverage of all meant faults.
4. Execution time depends on the necessities and criteria's. However changed code affects the present code, which can calculate how briskly faults area unit coated below every criterion.
5. It is very important that worth of 1 criterion don't conflict with analternative. If statement coverage area unit additional and events area unit quite faults detected are additional.

Strategy

Most of the researchers use various criteria's and test those criteria's one after another, but using all in one helps in reducing the work of software tester. They use "Branch" and "all-use" criteria i.e. Branch criteria helps if one fails it will pass to another one. Whereas the all-use takes all features into the count, it checks in detail what the previous work is. Event coverage helps to check how many tasks are performed and how many are failed. Statement coverage helps in having sub test cases in one test case. Maximum statements must be covered in each criterion.

Regression testing first collects the data to test and then made the result. Run the test and then compare the tested outcome with the previous result. If results vary then Fault may exist in the modified part which may affect the existing part.

Research Process

The process of having the Ant Colony Algorithm in our research work defines the designing of our work with the algorithm.

Objective: First task is to have the objective of the work. In our research, our main objectives are statement coverage, event coverage, less execution time.

Variables: Variables can be the length of events, the number of test cases, and calculated number of seconds to detect the fault.

Evaluation: Evaluation of the process deals with the failure criteria.

Comparison: Comparison depends on the execution time and fault covered.

Methodology

➤ *Ant colony using Hybrid Criteria*

- The main goal of Ant colony optimization algorithm is to have end result on the basis of achieving a minimum number of test cases. Ants select the Path with the deposition of pheromone.
- The methodology is used to have required objectives which can be achieved by selecting test cases in proposed Ant Colony Algorithm. Ant colony optimization main task is to do Pheromone deposition after knowing the best-suited path for food. Ants have different behavior and different types of Ants choose adifferent path for Pheromone deposition and Trail pheromone evaporation.
- Pheromone deposition is tocalculate the fitness i.e. Number of test cases is equal to number pheromone deposited by Ants in the path randomly.
- Trail pheromone is one who deposits the pheromone and after giving path they evaporate.
- High probability path is calculated with the help of pheromone deposition.

Ant colony Optimization is a part of swarm algorithms and consists of following reasons to choose in our work

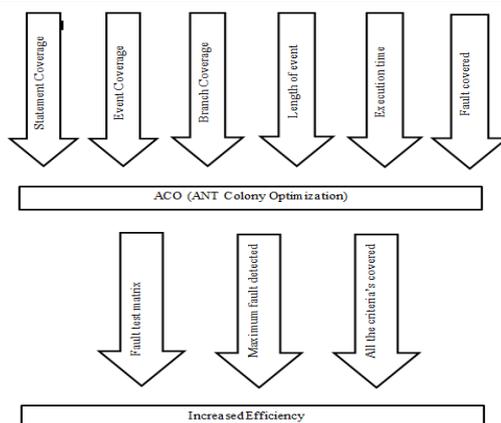


Fig 1: Working of ACO

Ant colony Optimization is a part of swarm algorithms with consists of following reasons to choose in our work

- Ants have a number of control parameters. Maximum control in the algorithm is covered by the ants who deposited higher density pheromone while going from the path randomly.
- Ants in the process cover the path faster and are less time consuming. Whereas in BCO optimization, it is hard to calculate.
- ACO Optimization consists of both the terms exploitation and exploration. Pheromone deposition is the one by through ants can communicate whereas in BCO it is hard to understand the communication because of Waggle dance
- In ACO pheromone evaporate after showing the path. But in BCO, three kinds of Bee's exists who do path coverage employed, onlookers and scout which make the working typical.
- ACO took first priority of test cases randomly then work further according to pheromone deposition.

➤ *Metrics used in hybrid criteria*

APFD (average percent fault detection) is to calculate the value of priority according to different outputs and software. To measure the effectiveness of a test order, we use the average percent of faults detected metric. Although several metrics exist to evaluate prioritized test orders, APFD is the most commonly used metric. For a test suite T with n test cases, if F is a set of m faults detected by T, then let TF_m be a test case from the test suite having that particular fault. So APFD metric is given as:

- Values calculated by APFD should be > 0.5 then it will be effective in our work.
- Total number of test cases are 5

$$APFD = 1 - \frac{TF_1 + TF_2 + \dots + TF_m}{mn} + \frac{1}{2n}$$

Where TF₁ is the value of that test case which is having the first fault. TF₂ is the value of that test case which is having a second fault and so forth.

m= Modified the number of lines, n= Number of test cases.

First Hybrid Criteria

A number of criteria's on which our hybridization depends on is Events, Statements, Branches, Execution time, and Error covered. Test cases must be selected first to have the total number of inputs within the test suite. The length of the test cases covers the number of events, statements, and branches covered with each criterion of the test cases. First we have to initialize the control parameters needed for ant's to prioritize the test cases.

➤ *Table showing the entire Criteria's Results.*

- Each criterion shows its own coverage area individually depends upon coverage faults detected.
- Execution time shows the duration of detecting the fault in time.
- The value of priority is changing with each run.
- The best solution chosen out of each run will depend on the APFD value.

Table 1: Results of Fault Coverage

RUN	Statement	Event	Branches	No. of fault covered	Execution time in sec	Priority	APFD
1	4	2	0	2	5		



	2	2	1	2	1		
	3	2	2	2	8		
	2	1	1	1	1		
	1	2	1	0	9	2,4,1,3,5	0.62
2	4	2	0	2	5		
	2	2	1	2	1		
	3	2	2	2	8		
	2	1	1	1	1		
	1	2	1	0	9	3,2,1,4,5	0.74
3	4	2	0	2	5		
	2	2	1	2	1		
	3	2	2	2	8		
	2	1	1	1	1		
	1	2	1	0	9	1,3,2,5,4	0.72

➤ *Calculated Value of APFD Comparison*

- Best case chosen is 0.74 i.e. Run 2. The graph shows the relationship of APFD values and our result values to show the efficiency.
- Rank arranges which path to follow. Merge initializes values and merges the all the values and detect the fault. Choice selects only one from a set of equally important criteria using a user-supplied selection function. Choice gave the accurate value which we need to select.

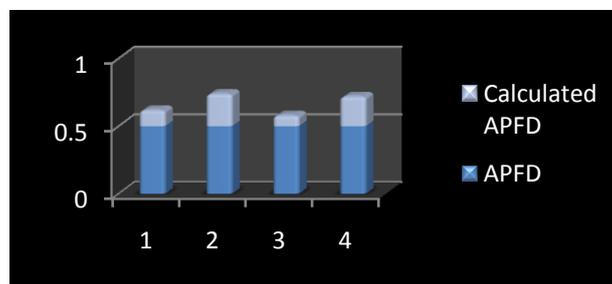


Fig 2: Calculated Value of APFD

Second Hybrid Criteria

Different cases have different results; in this case, we took the different program to test the priority. All the criteria's varies according to the code coverage. According to priority, swapping technique is used to set a graph for Ants. Ants select the path on the basis of previous iteration density of finding the fault.

➤ *Calculating Input Variables*

After having the input files we will calculate the variables as follows.

- Total Ants in the loop: It is to tell total number of Ants who are going to find the solution to a particular problem.
- Total number of test cases used: Total number of test cases is chosen from the test suite.
- Iteration Used: Out of a total number of test cases how much iteration is chosen to be used are given.
- Pheromone deposit factor: It tells about the pheromone deposition by Ants.
- Pheromone decrement factor: It gives the value of how much density of pheromone is evaporated during iteration.
- Constant alpha: Alpha value is chosen to be 2 in our work.
- Constant beta: Beta value is chosen to be 1 in our work.

Ant colony optimization show effective result for checking the test case priority. One task is to have the code and took the test cases which can be possible in code. Test case selection and prioritization are essential for maintaining software. Every developer/tester faces this challenge in each organization. In the absence of any effective technique, the random selection of test cases may prevail and the outcome regarding the correction of the program may be illusive and sometimes becomes incorrect. The impact analysis of the changes to the program may further become difficult and time-consuming. Hence, an effective technique not only reduces maintenance effort but can also perform the desired impact analysis properly. Moreover, such a technique is now a focus of maintenance activities and helping to preserve the quality of the software. The proposed regression test selection and prioritization technique is efficient in regression testing and thereby



reducetheprocess of selecting the priority. Adequate regression testing will also ensure the quality and reliability of the modified software.

Table 2: Results of Fault Coverage APFD value

RUN	Statement	Event	Branches	No. of fault covered	Execution time in sec	Priority	APFD
1	4	2	0	4	5		
	2	3	1	4	1		
	3	2	2	5	8		
	2	2	2	3	1		
	1	2	1	4	9	3,2,1,4,5	0.9
2	4	2	0	4	5		
	2	3	1	4	1		
	3	2	2	5	8		
	2	2	2	3	1		
	1	2	1	4	9	5,2,1,3,4	0.86

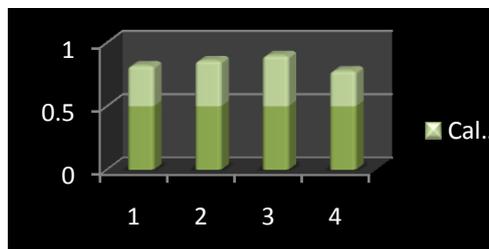


Fig 3: Graph Showing Calculated Solution

- Best case was chosen in this case 0.9 i.e. Run 1.
- Above given table and graph shows APFD value with the same input variables.
- Out of all iteration's, best case chosen by the Ants is a shortest path covered.
- In number of Runs, a number of Ants i.e. 4 has different iteration.
- Priority selected in the best solution is 3, 2,1,4,5.

Final Results

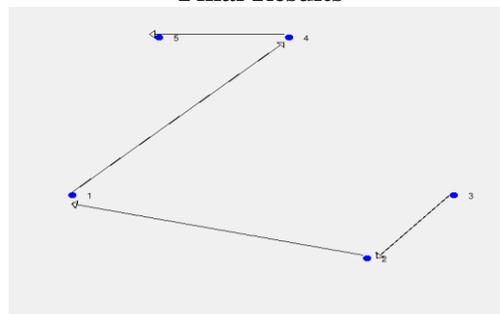


Fig 5: First Best Priority Graph

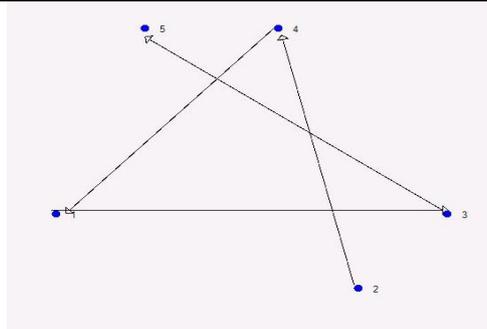


Fig 6: Second Best Priority Graph

CONCLUSION

The goal of our work was to use the hybrid criteria by using rank, merge and choice techniques to perform the various regression testing activities. We focused on regression test case selection, prioritization and then reduction process. So our result shows the effective priority of finding the faults by covering all the criteria's together. Our result helps software testers in their practice to test thousands of test cases in an effective manner. Our result is efficient because of following reasons:

- The proposed technique increases the efficiency of hybrid criteria.
- It increased the guarantee that modified part is corrected and do not have intended fault.
- Test cases selected covered all the statements, events, branches within the documents.

Future work is to analyze the process of regression testing using a uniform representation of hybrid criteria with the large program to make it more effective.

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