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An Effective HFFA Algorithm with K-means Clustering Prioritization Method for Regression Test Case Optimization

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Abstract: ***In earlier stages , to increase the rate of fault detection of testing process , re-ordering the execution of test suite is involved by regression test case prioritization technique. In this paper, test case prioritization algorithm is proposed to identify critical faults and improve the rate of fault detection. To improve the regression testing process, test case prioritization techniques systematizes the execution level of test cases. One of the most critical activities of software development and maintenance, known as regression testing. Regression testing has been proved to be crucial stage of software testing. In our proposed study we introduce a hybrid firefly algorithm based regression test case prioritization. The major contribution of our study is regression test case generation, factors identification, clustering for test case prioritization, optimization of prioritized test case. In this research, the K-means clustering algorithm will be used to separate the relevant test cases from irrelevant test cases. Relevant test cases denote the prioritized test cases. We will consider only this relevant test cases resultant from the clustering algorithm in order to optimize it with Hybrid Fire Fly Algorithm (HFFA). HFFA works by the hybridization of Artificial Bee Colony (ABC) Algorithm and Fire Fly (FF) Algorithm. ABC algorithm is a part of a swarm based meta-heuristic algorithm which is enthused by the sharp foraging behavior of the honey bees. In our HFFA Optimization Algorithm, the FF will be processed within the scout bee component of ABC, which leads to fast convergence and limited search space controlled based optimization of locations. Thus we will obtain Effective prioritized test cases.***

Keywords: Regression Testing, Software Testing, Prioritization, Optimization, Artificial Bee colony, Firefly, K-Means.

I. INTRODUCTION

Customer satisfaction is becoming main focus of the software development companies. To achieve this target software testing plays an important role. Hence software development processes are becoming large and complex and has several activities involved in it. To meet the desired requirement, these activities need to be suitably co-ordinate. Software testing is a process which often considered as an expensive and uncontrollable . It is a process by which we executes the system to identify gaps, errors or missing requirements between actual requirement and specified requirement.

Software maintenance becomes most important phase of the software testing. Whenever modifications are done in this phase, retesting of software application is required. The process of retesting such a software is called regression testing. Regression testing is a type of software testing that seeks to check that the changes made to a system have not introduced new faults in the system. Though regression testing is costly, it is required to perform it on the modified parts of the software. During regression testing, new functionality may be added to the modified software or module to improve it's response time. Regression testing involves re-testing of an application or system that has been modified to insure that no previously working components, functions or features fails as result of the repairs. Regression testing is executed parallel with other tests.

The regression testing is having two major parts as Test case selection and test case prioritization. In the regression testing we get already designed test suite for reuse and regression test selection technique may help us to select appropriate test cases from these test suite. Test case selection works out the problem of choosing the test case which will be helpful to check the modified part of the software. Due to growth of application the test cases also grows and it becomes impossible to implement all the test cases with in a specific amount of time. Test case selection deals with the execution of relevant test cases to find the changes between the previous and the current build of application. Test case prioritization techniques are scheduled over test cases in an order to improves the performance of regression testing. Test case prioritization works on the priorities based on the importance and the customer usage. Test case prioritization technique schedules the test cases for execution depending upon its priority, means the test cases with higher priority executed before lower priority. The objective of test case prioritization is to detect fault at early stages.

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II. LITERATURE SURVEY

Several techniques were proposed by various authors for Regression Testing and a few of them are explained below:

Hyunsook Do et al [12] have proposed a series of experiments to assess the effects of time constraints on the costs and benefits of prioritization techniques. Their first experiment has manipulated time constraint levels and also they have shown that time constraints do play a significant role in determining both the cost-effectiveness of prioritization and the relative cost-benefit trade-offs among techniques. Their second experiment has replicated the first experiment, controlling for several threats to validity including numbers of faults present, and also shown that the results generalize to this wider context. Their third experiment has manipulated the number of faults presented in programs to examine the effects of faultiness levels on prioritization and shown that faultiness level affects the relative cost-effectiveness of prioritization techniques.

Md. Imrul Kayes et al [13] have proposed a new metric for assessing rate of fault dependency detection and an algorithm to prioritize test cases. Using the new metric the effectiveness of that prioritization was shown comparing it with non-prioritized test case. They have also proposed a metric to measure effectiveness of test case prioritization in regression testing and a prioritization technique which can be used to improve the rate of dependency detection for regression testing. Analysis was done for prioritized and non-prioritized test cases with the help of proposed metric. The metric proposed has considered fault severity and test case execution time to be uniform. Analysis has proved that prioritized test cases are more effective in detecting dependency among faults.

Hong Mei et al [14] have proposed an approach to prioritizing test cases in the absence of coverage information that operates on Java programs tested under the JUnit framework. Their results have shown that the test suites constructed by JUnit test case Prioritization Techniques operating in the Absence of coverage information (JUPTA), were more effective than those in random and untreated test orders in terms of fault-detection effectiveness.

Although the test suites constructed by dynamic coverage based techniques have retained fault-detection effectiveness advantages, the fault-detection effectiveness of the test suites constructed by JUPTA was close to that of the test suites constructed by those techniques, and the fault-detection effectiveness of the test suites constructed by some of JUPTA's variants was better than that of the test suites constructed by several of those techniques.

Siavash Mirarab et al [15] have proposed an approach for selecting and ordering a predetermined number of test cases from an existing test suite. Their approach has formed an Integer Linear Programming problem using two different coverage-based criteria, and has used constraint relaxation to find many close-to-optimal solution points. Those points were then combined to obtain a final solution using a voting mechanism. The selected subset of test cases was then prioritized using a greedy algorithm that maximizes minimum coverage in an iterative manner.

ZHANG Zhi-hua et al [16] have proposed a set of prioritization algorithms. They have also explained a new exploration for regression testing prioritization technique which oriented function call path. Static paths on function call obtained by analyzing the source code, combined with the dynamic path after executing test cases, the correspondence was built between test cases and the static paths, identifying the changes which software developers modify program to correct defects, given different priority to test case based on path coverage, test cases were selected in accordance with their priorities in regression testing. This set of prioritization algorithms has improved the efficiency of regression testing and guarantee testing adequacy, because only the modified and affected parts of software were tested.

Sreedevi Sampath et al [17] have proposed the notion of combining multiple criteria into a hybrid. Their goal was to create a uniform representation of such combinations so that they could be described unambiguously and shared among researchers. They have precisely formulated three hybrid combinations Rank, Merge, Choice and demonstrated their usefulness in two ways. Their findings have suggested that hybrid criteria of others could be described using their Merge and Rank formulations. The hybrid criteria they developed most often outperformed their constituent individual criteria. Finally, the framework provides a step toward helping researchers to create shared tools and artifacts that use a uniform representation.

Ke Zhai et al [18] have proposed a suite of metrics and initialized them to demonstrate input-guided techniques and point-of-interest (POI) aware test case prioritization techniques, differing by whether the location information in the expected outputs of test cases was used. It was reported a case study on a state full LBS-enabled service.

The case study has shown that the POI-aware techniques could be more effective and more stable than the baseline, which reorders test cases randomly, and the input-guided techniques. They have also found that one of the POI-aware techniques, cdist, was either the most effective or the second most effective technique among all the studied techniques in our evaluated aspects.

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III.PROPOSED WORK

The test case prioritization problem has newly engaged in scheduling test cases for regression testing in an order that raises their efficiency of performance goal. In regression testing this is unsuccessful to re-execute all the test case. Prioritization methods order the test cases for regression testing using information attained from earlier test case execution. In Regression Testing we have proposed to suggest an approach to prioritize test cases. In order to accomplish efficient Test cases, we will improve a prioritization technique based on fire fly algorithm.

A. Regression Test Case Generation

The principal objective underlying our approach will be to produce efficient test cases. In this phase, test cases will be produced for the input case study. The test case generation is one of the significant steps applied to find the most important test cases in the study.

B. Factors Identification

In this phase , some factors will be regarded in order to prioritize the test cases. The factors exploited here will be time, trace events, behavioral dependency and responsibility. In order to make out the prioritized test cases, these factors will be used

C. Clustering for Test Case Prioritization

The K-means clustering algorithm will be applied to divide the related test cases from unrelated test cases in this research. Relevant test cases indicate the prioritized test cases which will be in this phase.

D. Optimization of Prioritized Test Cases

Finally in last phase, in order to optimize it with Hybrid Fire Fly Algorithm (HFFA) we will reflect on only this related test cases resultant from the clustering algorithm.

The firefly algorithm is a meta-heuristic algorithm; it is excellent in flashing behavior of fireflies. The unique work for a firefly's flash is to perform as a signal system to draw other fireflies. HFFA efforts by the hybridization of Artificial Bee Colony (ABC) Algorithm and Fire Fly (FF) Algorithm. ABC algorithm is a swarm based meta-heuristic algorithm which is motivated by the sharp foraging behavior of the honey bees. It contains three components namely, employed bees, onlooker bees and scout bees. The number of food sources indicates the probable solutions of optimization problem and the nectar amount of a food source indicates the quality of the solution. The FF will be practiced inside the scout bee component of ABC in our HFFA Optimization Algorithm, which leads to rapid convergence and restricted search space controlled based optimization. As a result we will get Effective prioritized test cases. Our approach will be implemented on Java program with a hospital management case study as an input and the presentation will be assessed with different evaluation metrics. For assessing the superiority Average of the Percentage of Faults Detected (APFD) will be the major evaluation metric applied. Performing the test cases based on our prioritization algorithm will significantly give efficient test cases. The suggested technique will be competent in prioritizing the regression test cases. The implementation will be done in JAVA.

IV. CONCLUSION

A hybrid firefly-ABC based prioritization with four phase's test case generation, factors identification, test case prioritization and test case optimization. The test case generation techniques aim to generate test cases which maximize cover for each scenario. From that test case we are performing factors identification the factors utilized here will be time, trace events, behavioral dependency and responsibility. These factors will be employed to identify the prioritized test cases. Then the test cases are prioritized by using a hybrid firefly-ABC technique. The evaluation measures of APFD were evaluated for our proposed method. The test case prioritization time and taken memory space are discussed and is very high by presenting very good outcomes and also the prioritization of test case is gives very accurate outcomes. From the outcomes, we have showed that the hybrid firefly-ABC utilized in our proposed work outperforms the other classifiers by facilitated very good accuracy. Thus, we can observe that our proposed work is better than other existing works for the regression test case prioritization.

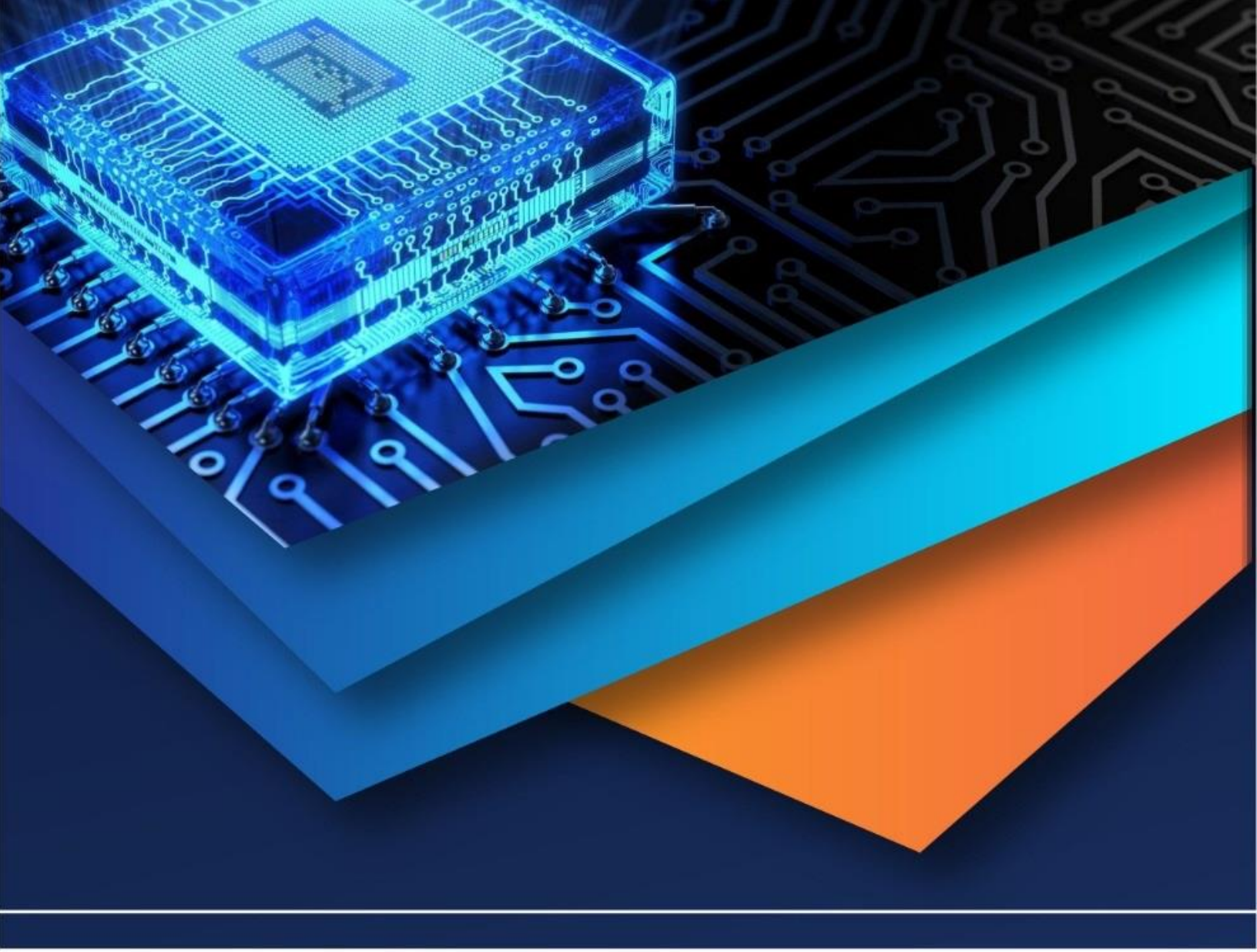
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