ABSTRACT

Testing is an ever green field of research and always it is the choice of researchers due to its importance in any software development. A proper blend of test plan and test cases is essential for the development of bug free quality software with minimum project time and cost. The effectiveness of the test cases in turn depends on the number of factors like execution time, completeness, memory usage and fault coverage.

The software systems change and evolve over time because of the changes in the technology, changes in current setting of the system etc. Whenever the system is changed, the system has to be validated using regression testing. An important issue in regression testing is the cost and time it is incurring in retesting the whole system. Test case prioritization is the most familiar technique in regression testing that is used to deal with this problem.

The thesis focuses on prioritizing the test cases in a system while conducting the regression testing so as to reduce the number of test cases in a test suite and prioritize the test cases while retaining the high percentage of the original suite’s fault detection effectiveness. The effectiveness of the system is maximized by combining the reduction, optimization and prioritization
of test cases using feature selection, birds flocking algorithm and genetic algorithm. Hence, an integrated approach is introduced for test case prioritization which uses the advantages of feature selection, birds flocking and genetic algorithm.

The objective of the present work is to prioritize the multi objective test case system using an integrated approach. Accordingly, the main contributions of this work include the following:

1. Test case reduction using minimum Redundancy Maximum Relevance (mRMR) feature selection algorithm.

Test cases are reduced based on their mutual information value. This approach selects the test cases with maximum relevancy to the objective function and minimum redundancy among test cases.

2. Test case Optimization using birds flocking algorithm.

The test cases are clustered based on the objective functions and the dissimilar ones are treated as outliers.

3. Test case prioritization with genetic algorithm.

For prioritization, genetic algorithms are used because of its ability to solve complicated global optimization problems.
4. In regression testing, the performance of the multi objective test case prioritization system before and after test case prioritization is compared.

5. Real time implementation of an integrated multi objective test case prioritization scheme.

The chapter 1 deals with introduction and formation of objective function for the regression testing of the multi objective integrated system testing.

The chapter 2 deals with literature survey. This presents an overview of relevant research works.

The chapter 3 deals with test suite reduction. For the reduction of test cases mRMR feature selection technique is used. The mRMR feature selection uses the concept of maximum relevance and minimum redundancy. The drawback of this method is that the test cases are not optimized. So the optimization is done in the next chapter.

The chapter 4 deals with test suite optimization. The optimization is performed using the birds flocking algorithm which is a particle swarm optimization technique where the test cases are clustered based on their objectives using birds flocking algorithm. The effectiveness of test cases can still be increased by prioritizing the test cases. So, prioritization is done in the next chapter.
In chapter 5 the prioritization of test cases is done using genetic algorithms. The genetic operators are used to develop the fittest test cases for the regression testing where ranking of test cases are done using the genetic algorithm concept fittest test case. The effectiveness of the test suite is improved by having number of generations.

Chapter 6 deals with the performance analysis of the test cases. A detailed analysis is made on the performance of the proposed system by comparing the system before and after prioritization. In the performance analysis process, the metrics APFD, APSC, APBC APPC, APFC and APFDc are used. The effectiveness of the test cases after applying the prioritization technique is higher than the effectiveness of the test cases before prioritizing them.

Finally, chapter 7 presents conclusions and suggestions for future work.

The effectiveness of the integrated system is increased by maximizing the fault detection, maximizing coverage, minimizing memory usage and minimizing execution time. There is a clear distinction between the values of metrics before and after prioritization of test cases while conducting regression testing. The result obtained shows that the prioritized system has higher efficiency. Therefore the integrated multi objective system for test case prioritization system is found to be a viable solution for regression testing.