Software Testing using Intelligent Technique

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ABSTRACT
This paper proposed software testing system by using Artificial Intelligent techniques. In today’s scenario, Software Testing is a critical issue in software development and maintenance for increasing the quality and reliability of the software.

In Software Testing, regression testing is often performed and researchers are finding ways to reduce the regression testing cost. In this paper, an approach is proposed which draws inspiration from Swarm Intelligence to reduce test suite for regression testing. This approach will strive to get the best optimal solution and contribute a lot in considerably reducing the testing cost, efforts and time of regression testing.

General Terms
Algorithms, Regression Testing, Test Case, Prioritization

Keywords

1. INTRODUCTION
Testing is a process of executing a program with the goal of finding errors. To test the code there are different types of testing among which regression testing is one of it. Regression testing is performed frequently by the Testers as they retest to ensure that the program behaves as expected. An innovative approach to effective fault-revealing regression test cases is by taking the advantages of Swarm Intelligence. Swarm intelligence (SI) is used to solve optimization problems. The main areas of SI are Ant Colony Optimization, Particle Swarm Optimization; Biogeography based Optimization and Bee Colony Optimization.

Swarm AI Principle:
Principle 1: Create a system of agents that work individually on a common problem
Principle 2: Agents are simple, fast, and have a limited perspective
Principle 3: Indirect Simple Inter-Agent Communication. [5]

The intent of this paper to reduce and prioritized the test cases based on Swarm Intelligence by using Ant Colony Optimization. Many literatures illustrated that Ant Colony System Algorithm is more competent and efficient in local search.

Ant Colony Optimization algorithms should conform to the ACO-Meta heuristic:
Set parameters, initialize pheromone trails
1) While termination condition is not met do

2) Construct Ant Solutions
3) Apply Local Search (optional)
4) Update Pheromones
5) End while.[3]

The rest of the paper is organized as follows: Section 2 Literature Review Section 3 describes the proposed approach to cost effective regression Section 4 concludes, is presented.

2. LITERATURE REVIEW
On realizing the importance of software testing various literature surveys are conducted whereby Daniel Di Nardo in the industrial case study pointed out the importance of Test Case Prioritization with real regression faults because in regression testing when the code changes we have to retest even those successfully executed test suites to check whether the changes have introduced to new bugs or faults. As a result the problem here is that there is time consuming and extra efforts and resources needed.

Wang Jun proposed test case prioritization by using genetic algorithm and the regression-based testing was improved in the way that faults can be revealed more quickly, increase the Software Reliability and also save computational time and resources [7].

Geniana Ioana Laiu tested the evolutionary algorithms by generating the path test data and their results are compared. The result shows that Simulated Annealing gives quality test data as compared with Particle Swarm Optimization and Genetic Algorithm [11].

Chengying Mao stated that Ant Colony Optimization is not still deeply studied in generating test case and prioritization and proved that Ant Colony Optimization outperforms the algorithms namely: Simulated Annealing and Genetic Algorithm is and also stated “The possible future improvement can be focused on reducing the time of global/local search and pheromone update” [1].

3. PRESENT WORK
Presently, Bharti Suri implemented Ant Colony Optimization Algorithm for Test Case Selection and Prioritization. They have showed how the ACO is useful for choosing the optimal solution and also there was reduction in the test suite size. The results obtained are closely related to the optimal solution. The best solution was not found by them for all cases. Thereby seeds an inspiration for the possible improvements [15].
4. COMPARATIVE ANALYSIS OF EXISTING TECHNIQUES

![Table with experimental results of Algorithms for Test Data Generation](image1)

**Fig 1:** Experimental results of Algorithms for Test Data Generation[1].

5. THE PROPOSED APPROACH

In this paper, an approach is proposed to reduce the test suite of regression testing by using Ant Colony Optimization. The researchers are working on to find a better way for solving test case selection and prioritization problem using Ant colony Optimization. The results obtained by the researchers till date are close to optimal results but the best solution was not obtained.[15].

In the proposed system Ant Colony Optimization algorithm will be used for test case selection and prioritization.

Our proposed approach performs the following tasks:

1) Generating path details for each iteration.
2) Eliminating the redundant test cases.
3) Generating the pheromone table.
4) Selecting and prioritizing test cases.
5) Selecting the best path with minimum execution time

The proposed approach will attempt to get a better result out of it using Ant Colony Optimization. Selecting test cases from the test suites will reduce the test efforts and incorporating it with prioritization using appropriate Optimization algorithm will lead to better and effective fault revealing.

So, in this paper an approach is proposed that will use a better ACO for regression testing. This approach will contribute a lot in considerably reducing the testing cost, efforts and time of regression testing. It will strive to get the best optimal solution.

The figure below shows a sample Model of Input and Output for the proposed approach.

![Diagram showing test case selection and prioritization](image2)

**Fig 2:** A Sample Model of Input and Output for the proposed approach
The basic flow of the proposed approached is shown below.

![Fig 3: Basic Flow of the Proposed Approach](image)

6. EXPECTED RESULT

The proposed approach will result in:

- Minimizing execution cost.
- Minimizing test design efforts/cost.
- Maximum coverage ability of codes.

7. CONCLUSIONS

The quality of test case gives a great impact to software testing activity in fault-revealing. The intent of this paper is to propose an approach which uses Ant Colony Optimization Algorithm for reducing the test suite. This approach will contribute a lot in considerably reducing the testing cost, efforts and time of regression testing. In future, the proposed approach will be implemented in C++ code compiled using TurboC++ compiler. The result will be observed from the graphical representation that the nodes connected via the edges with maximum weight (pheromone) will be selected as the final solution or the best path.

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9. REFERENCES


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