Test Case Minimization Strategy based on Flower Pollination Algorithm

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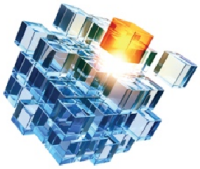
Highlights: The phenomenon of exhaustive testing in software testing is hard to implement due to a huge number of test cases and time-consuming in order to find bugs. Hence, a test cases minimization strategy is an essential to obtain an optimize test cases and consequently, time will also be reducing. An adoption of optimization based t-way strategies and non-optimization based t-way strategies have come across. This paper describes the adoption of Flower Pollination Algorithm (FPA) in order to minimize the test cases. The FPA inspired from the reproduction of flowers to find the best optimum results when compared to other methods. This strategy will be evaluated by several published benchmarking.

Key words: *Exhaustive Testing, Software Testing, Time-consuming, Optimize Test Cases, Test Case Minimization Strategy, Flower Pollination Algorithm*

Introduction

Software testing is a process to find errors or defects and to ensure the software of interest meets its specification. It is also a process to validate and verify a software program or product to meet the business and technical requirements. Software testing should take place throughout the Software Development Life Cycle (SDLC)



(Cohen, 2004). Thus, software testing plays an important role in a software system.

Some testing techniques are considered as an optimization problem. One of the optimization problems is Combinatorial Testing (Nie and Leung, 2011) Problem. In software testing, test cases are running on the software to find errors and it needs to be defined along with the requirement specification. Normally the number of test cases are generated is huge and very difficult to be optimized. By using Combinatorial Testing strategy, it helps to generate a set of tests and forming a complete test suite that covers the required combinations in accordance with the strength or degree of combination (Cohen, et al, 1996). Combinatorial Testing covers interactions of parameters in the system under test. The number of tests needed for combinatorial coverage of a number of parameters with a number of values. To apply combinatorial testing, it is necessary to find a set of test inputs that covers all t-way (t is the degree of the system parameter combination) combinations of parameter values and to match up each set of inputs with the expected output for these input values. Consequently, redundant test cases are removed from the test suite. Thus, the cost of software can be reduced in the way of reducing the number of test cases.

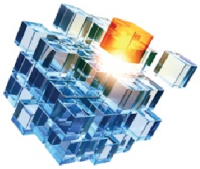
Apart from that, there are also many t-way strategies based on optimization algorithms to minimize test cases and save cost such as Genetic Algorithm (MAO and YU, 2013), Harmony Search Algorithm (Wang and Huang, 2010), Ant Colony Optimization Algorithm (Chen, et al, 2009), Particle Swarm Optimization Algorithm (Ahmed and Zamli, 2010), Simulated Annealing Algorithm (Cohen, Colbourn and Ling, 2008) and other optimization algorithms. One of the optimization

algorithms is Flower Pollination Algorithm (Yang, 2012). Even though the current existing t-way strategies are helpful, but none of these strategies can guarantee to generate optimum results for every system configuration under testing. Here, this project will investigate the adoption of a new optimization algorithm called Flower Pollination Algorithm (FPA) in the t-way testing. FPA is based on pollination mechanisms of flowering plants.

Specifically, FPA is easy to be implemented compared to other algorithms. This is due to the reason of the parameter is less in order to solve the problem of tuning the parameters. In contrast, FPA, unlike Genetic Algorithm that consumes so much time in the process of tuning. Genetic Algorithm can do much time for algorithm convergence purpose only. When population size or mutation rate is increasing in Genetic Algorithm, the rate of convergence will become slow. The purpose of all these operations is only to improve the rate of increase in the fitness function. This is the reason why FPA is being selected and implemented in this research thoroughly. Therefore, the purpose of this research is to adopt FPA strategy and combinatorial testing.

Description

The objective of Test Cases Minimization Strategy Based On Flower Pollination Algorithm is to design, implement and to develop a new test cases minimization strategy based on Flower Pollination Algorithm. The proposed strategy will be implementing using JAVA programming language to generate test cases that will be supporting interaction strength = 6. The proposed strategy will have a graphical interface to increase the usability for the use.



Background

Flower Pollination Algorithm (FPA) is one of the optimization techniques to solve global optimization problems. The idea of FPA comes from flower pollination process. This was developed by Xin-She Yang. FPA is a based on pollination mechanisms of flowering plants. It has been formulated for multi-objective optimization applications by mimicking the pollination process of flowering plants. FPA contains many benefits such as simplicity and flexibility [37], no tuning process is needed like Genetic Algorithm and offers balance intensification and diversification of solutions through the adoption of Lévy flights. The FPA has been adopted in a variety of fields such as in engineering optimization, solar PV parameter estimation and economic load dispatch problems .

Importance

It helps tester to save time by reducing the number of the test case using FPA rather than test a huge number of test cases. The cost and resources will be reduced indirectly when the time was decreased. The works can be done more efficiently and increase the productivity of the company. Besides, it can be used as tutorial tool for teaching purpose in BCS 3323 Software Testing & Maintenance, BCS 3263 Software Quality Assurance and BCS 3293 Software Configuration Management. It can also be used in UMP ICT when generating the test cases for the system.

Advantages

Test Cases Minimization Strategy Based On Flower Pollination Algorithm can be directed towards many high performance computing. Besides, it minimizes the probability of occurring errors if there is enough and efficient test cases being tested on the system. In

addition, it helps to reduce the cost, time, resources and effort. Consequently, the profit in a company or an organization definitely will be increased.

5. Please add any commercial value in terms of marketability or profitability of your innovation / product development / design / process if any.
It can become a software tool as other software selling on market if it is not an open source. This software tool is suitable in IT field, engineering field and education. This tool can be sold cheaper than available tools in the market. Besides, it can also be licensed software or sold for licensed company.

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