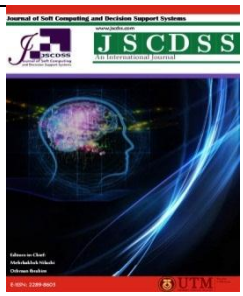
An International Journal
JSCDSS
http://www.jscdss.com
Vol.3 No.2 April 2016: 26-34
Article history:
Accepted 2 February 2016
Published online 2 February 2016

Journal of Soft Computing and Decision Support Systems



E-ISSN: 2289-8603

Automatic Test Data Generation Based on Hierarchical Model

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Abstract

The main discussion on software development is software testing with real data. Software testing is one of the expensive and time consuming processes and many studies have been conducted to facilitate and perform it automatically. One of the most important topics in software testing is developing the test path to general test data and coverage of the generated path. Generation the data for test includes identifying a complex of data which evaluate the test criterion. Optimization methods can be used to solve the problem of data testing. Heuristic search methods especially evolutionary algorithms are cost savings and can be effective in the automated generation of Test data. One of the most important challenges in the development of data tests is lack of full coverage of defined Ranges and ignoring the important parameters of user. In this study, a solution is proposed based on Hierarchical model and ant colony optimization algorithm and model-based testing to faster generation test input data and inserted to the program. Then, the test data will be provided and exported for further studies by using generation data and parallel running ant colony algorithm. The model in this study is based on Markov chain. The results obtained from Markov chain are good choices for studying the viability of the testing process while developing them. Evaluation of the proposed algorithm has shown better performance compared to existing methods in terms of cost, coverage, time and parameters of user.

Keywords: Ant colony optimization algorithms, Hierarchical model, Path-cover generation, Model-based testing, Test data generation

1. introduction

In order to assess the quality of software, it is necessary to examine software precisely to discover and solve their defects and problems; before they actually used. Developing test data for the generation of input data is very difficult and time consuming manually, so automated generation is used. Automated software testing could significantly reduce the costs of software development. Other benefits of this work are possibility to design more advanced tests and performing tests faster and more accurately even remotely (Collins et al., 2012; Nănău, 2010).

One of the methods of automated testing is test-based model which can make automated all kinds of tests such as unit testing, system testing and acceptance and provide better test coverage. The purpose of model-based testing is increasing reliability and reducing costs of software through automation of testing samples of official behavior in the system model.

Markov chain is a good choice for statistical model based testing and its main characteristics examine the feasibility of developed testing stages. In mathematical terms, transition from one state to the other is occurred in Markov chain; of course number of the States is countable. Markov chain is a stochastic process without memory means that the conditional probability distribution of the next State depends only on its current State and it is not related to the previous events.

Statistical model based testing in Markov chains uses Markov chains to develop software model which is proposed in and is a very efficient way to model the software under test.

In recent years, many efforts have been done to apply some optimization techniques based on search in the field of software testing. At first in 2003, ant colony optimization was used in the field of software testing and ant colony optimization approach and Markov model were described to carry out a series of test paths in a software system (Suwannasart et al., 2008). Another study presented an approach based on ant colony optimization to examine the software based on control flow by developing the test sequence (Srivastava and Rai, 2009). A simple algorithm was provided by ant colony optimization to help to define the optimal test path using the update feature by ant pheromones (study, ant colony optimization algorithm was used on data flow test that the algorithm is applied to generate sets of test data to cover the set of generated paths (Ghiduk, 2010). Experiment results in this paper show that this method works better in term of the number of test method, performance and percent of coverage compared to other related methods.

Recently, in (Shah et al., 2012) a method of non-repetitive transmitting mode based on ant colony