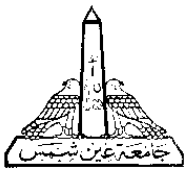

AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Computer and Systems Engineering

Test Cases Optimization Using Search Based Approach

A Thesis submitted in partial fulfillment of the requirements of the degree of

Master of Science in Electrical Engineering

(Computer and Systems Engineering)

by

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Bachelor of Science in Electrical Engineering

(Computer and Systems Engineering)

Faculty of Engineering, Ain Shams University, 2011

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Statement

This thesis is submitted as a partial fulfilment of Master of Science in Electrical Engineering Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Abstract

Faculty of Engineering

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Master of Science

Test Cases Optimization Using Search Based Approach

by Ghada El-Sayed

Structural coverage criteria are employed in testing according to the criticality of the application domain. Modified Condition/Decision Coverage (MC/DC) comes highly recommended by multiple standards, including, ISO 26262 and DO-178C in the automotive and avionics industries respectively. Yet, it is time and effort consuming to construct and maintain test suites that achieve high coverage percentages of MC/DC. Search based approaches were used to automate this task due to the problem complexity. My results show that the generated test data could be minimized while maintaining the same coverage by considering that a certain test datum can satisfy multiple MC/DC test targets. This improves the maintainability of the generated test suite and saves the resources required to define their expected outputs and any part of the testing process that is repeated per test case.

Summary

Many standards recommend Modified Condition/Decision Coverage (MC/DC) to be used as a structural coverage criterion in safety critical applications. So, my approach targets generating test data automatically to satisfy this coverage criterion. Then, I aim at optimizing the size of this generated test data while preserving the same coverage. Minimizing the size of test data saves the tester's effort and time in maintenance, documentation, defining the expecting outputs and most work that is done per test data. Also, in this approach I enhance some of the configurations mostly used in generating the test data automatically and show their effectiveness by experimental results.

Chapter 1 gives an introduction to the thesis and the domain requirements that are targeted. Also, lists a summary of the main contributions.

Chapter 2 discusses the need for using structural coverage criteria in testing and explains their types in details.

Chapter 3 introduces the approach of automating test data generation using different methodologies, illustrating the one used here; which is meta-heuristic search techniques (Genetic Algorithms).

Chapter 4 represents a survey of the previous related work by other researchers in this field and what was reused from this survey. Also, defines the problem and my proposed approach to solve it.

Chapter 5 gives the detailed implementation of the solution and the enhancements applied on some configurations. Also, gives the experimental results obtained from this work that illustrate its effectiveness.

Finally, Chapter 6 gives the work conclusion and the future work.

Keywords: DO-178C, Search based testing, Maintainability, MC/DC, Optimization, Structural coverage

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