Málaga, Julio de 2012

Informe Ejecutivo

Título: SOFTW-5.0-2012: Evolutionary Algorithm for Prioritized Pairwise Test Data Generation

Resumen: En este informe se presenta el trabajo realizado en el entorno de DIRICOM referente a un algoritmo genético para la construcción de test suites para el testeo de software, a partir del modelo funcional del programa. En esta propuesta se generan datos de prueba para diferentes modelos extraídos de la literatura y además, se estudia el impacto de diferentes distribuciones de probabilidad para ponderar las características del software. El algoritmo propuesto puede ser integrado en el software propietario de la empresa alemana Berner & Mattner, colaboradores en este trabajo.

Objetivos:

1. Estrategia constructiva para la generación de datos de prueba ponderados a partir de un modelo de programa.
2. Experimentación y análisis respecto a las distribuciones de probabilidad para asignar prioridades.
3. Análisis de las soluciones comparando con otros algoritmos del estado del arte.

Conclusiones:

1. Los resultados obtenidos ponen de manifiesto que el algoritmo genético propuesto es competitivo, ya que mejora los resultados de los otros 4 algoritmos en la mayoría de los escenarios. Además, es la primera vez que se utiliza este tipo de técnica para lidiar con este problema concreto.
2. La propuesta presenta importantes ganancias en cuando al tamaño en las test suites generadas, además este trabajo ha asegurado una valiosa transferencia a la industria gracias a la colaboración con la empresa alemana Berner & Mattner.

Relación con entregables:

PRE: SOFTW-4.0-2011 (lectura recomendable)

PRE: SOFTW-3.0-2009 (lectura recomendable)

Málaga, July, 2012

Executive Summary

TITLE: SOFTW-5.0-2012: Evolutionary Algorithm for Prioritized Pairwise Test Data Generation

ABSTRACT: This report presents a genetic algorithm for the construction of test suites for software testing, from the functional model of a program. This proposal generates test data for several program models extracted from the literature. It also studies the impact of different probability distributions for weighing the features of the software. The proposed algorithm can be integrated into proprietary software from a German company called Berner & Mattner, contributors to this work.

GOALS:

1. Designing a constructive algorithm for the generation of test data from a model of a program.
2. Experimental analysis concerning the probability distributions to assign priorities to the software features.
3. Experimental comparison of the results obtained by several state of the art algorithms.

CONCLUSIONS:

1. The obtained results in this study highlight that the genetic algorithm is competitive, because it improves the results obtained by the other algorithms in most scenarios. In addition, to the best of our knowledge, it is the first time that an evolutionary algorithm is used to solve this problem.
2. Our proposal presents important improvements regarding test suite size. Additionally, this work has assured a valuable industry transference of knowledge due to the collaboration with the German company Berner & Mattner.

RELATION WITH DELIVERABLES:

PRE: SOFTW-4.0-2011 (advisable reading)

PRE: SOFTW-3.0-2009 (advisable reading)

Evolutionary Algorithm for Prioritized Pairwise Test Data Generation

DIRICOM

July 2012

1. Referencia del trabajo

Javier Ferrer, Peter M. Kruse, Francisco Chicano, and Enrique Alba. **Evolutionary algorithm for prioritized pairwise test data generation**. In Proceedings of the fourteenth international conference on Genetic and evolutionary computation conference, GECCO '12. URL `http://doi.acm.org/10.1145/2330163.2330331`.

1.1. Paper Abstract

Combinatorial Interaction Testing (CIT) is a technique used to discover faults caused by parameter interactions in highly configurable systems. These systems tend to be large and exhaustive testing is generally impractical. Indeed, when the resources are limited, prioritization of test cases is a must. Important test cases are assigned a high priority and should be executed earlier. On the one hand, the prioritization of test cases may reveal faults in early stages of the testing phase. But, on the other hand the generation of minimal test suites that fulfill the demanded coverage criteria is an NP-hard problem. Therefore, search based approaches are required to find the (near) optimal test suites. In this work we present a novel evolutionary algorithm to deal with this problem. The experimental analysis compares five techniques on a set of benchmarks. It reveals that the evolutionary approach is clearly the best in our comparison. The presented algorithm can be integrated into CTE XL professional tool.

2. Citas en la actualidad

Evelyn Nicole Haslinger , Roberto E. Lopez-Herrejon , Alexander Egyed, **Using feature model knowledge to speed up the generation of covering arrays**, Proceedings of the Seventh International Workshop on Variability Modelling of Software-intensive Systems, January 23-25, 2013, Pisa, Italy