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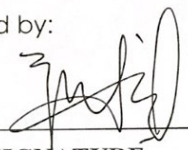

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TEST CASE PRIORITIZATION TECHNIQUE USING SEQUENCE DIAGRAM AND LABELED TRANSITION SYSTEMS IN REGRESSION TESTING

NUR FATIMAH AS'SAHRA

A dissertation submitted in partial fulfilment of the
requirements for the award of the degree of
Master of Science (Computer Science)

Faculty of Computing
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JANUARY 2015

I declare that this dissertation entitled "*Test Case Prioritization Technique using Sequence Diagram and Labeled Transition Systems in Regression Testing*" is the result of my own research except as cited in the references. The dissertation has not been accepted for any degree and is not concurrently submitted in candidature for any other degree.

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I strongly dedicated this dissertation to my beloved parents for their supports, encouragement and love.

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ABSTRACT

Model-Based Testing (MBT) utilizes the models of software to generate the test cases. In line with this, Unified Modeling Language (UML) is widely adopted as a modeling support for MBT and UML sequence diagram is one of the most important diagram in the creation of test cases under MBT umbrella (aided by intermediate model). However, MBT method in general tends to generate a large amount of test cases. It is impractical in testing to execute all of the test cases, moreover if the size is large. Also, it has a greater impact on model-based regression testing. Regression testing is a testing process that is applied after software is modified. As a software evolves, some modifications or new features are added to the software. Thus, it also tends to increase the number of test cases. Retesting a large-size of test cases during regression testing stage is even harder since the allocated time and cost are more limited. In order to overcome this issue, a similarity-based selection technique based on Labeled Transition Systems (LTS) intermediate model is introduced. It will select only the subset of test cases that are less similar and has a larger coverage. Nevertheless, this technique still has a drawback. It does not consider the modified parts of the software while selecting the test cases for regression testing. Thus, this technique is against the goal of regression testing, which the test cases supposed to target the modified part of the software. Therefore, a test case prioritization technique is proposed. In the proposed technique, the generated test cases derived from sequence diagram and LTS intermediate model are prioritized for regression testing. Also, the evaluation of both techniques is done based on a set of two case studies. As a result, the proposed technique is able to overcome the issues of original technique by maximizing early coverage of the modified code in regression testing as well as achieve the early fault detection.

ABSTRAK

Ujian Berasaskan Model (MBT) menggunakan model perisian untuk menghasilkan kes-kes ujian. Selaras dengan ini, Bahasa Pemodelan (UML) secara meluas dipakai untuk pemodelan MBT dan UML rajah jujukan adalah salah satu gambarajah yang paling penting untuk menghasilkan kes ujian dibawah payung MBT (dibantu oleh model perantaraan). Namun, kaedah MBT umumnya cenderung menghasilkan kes ujian dalam jumlah yang besar. Pengujian ini tidak dipraktikkan untuk dilakukan pada semua kes ujian, apalagi sekiranya saiz adalah besar. Ia juga mempunyai impak yang besar pada model asas pengujian regrasi. Pengujian regrasi adalah proses pengujian yang digunakan selepas perisian diubahsuai. Beberapa pengubahsuaian atau ciri-ciri baru ditambah ke dalam perisian. Oleh itu, ia cenderung untuk meningkatkan bilangan kes ujian. Pengujian semula kes ujian bersaiz besar adalah lebih susah disebabkan masa dan kos yang diperuntukkan adalah terhad. Untuk mengatasi masalah ini, satu teknik pemilihan berdasarkan persamaan dalam model perantaraan Sistem Peralihan Lebel (LTS) diperkenalkan. Ia hanya memilih sebahagian kecil dari kes-kes ujian yang lebih kurang sama dan mempunyai liputan yang lebih besar. Namun, teknik ini masih mempunyai kelemahan. Ia tidak mengambil kira pengubahsuian bahagian perisian semasa memilih kes ujian untuk pengujian regrasi. Oleh itu, teknik ini adalah bertentangan dengan matlamat ujian regrasi, yang mana kes-kes ujian sepatutnya mensasarkan bahagian perisian yang diubahsuai. Oleh itu, keutamaan teknik kes ujian adalah dicadangkan. Kes-kes ujian diperolehi dari jujukan rajah dan pengantaraan model LTS untuk ujian regrasi. Penilaian kedua-dua teknik dilakukan berdasarkan kepada kedua kajian kes. Kesimpulannya, teknik yang dicadangkan mampu mengatasi isu teknik asal dengan memaksimumkan liputan awal dalam mengubahsuai kod dalam pengujian regrasi serta mencapai pengesanan kerosakan awal.

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