Connector-based Integration Testing For Component-based Software

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Abstract

Building a system from reused software components has been the key benefits introduced by the component-based software engineering (CBSE) approach. The systems developed from this approach are more flexible for facilitating adaptations, modifications and updates on their software components. Reuse of a poor quality software component, or improper use of a good quality software component, could lead to disastrous effects on the system users. Adding to these setbacks, the lack of information about the reused or updated components, and the lack of information on complex interactions between components can also lead to the new component integrations being left untested, or insufficiently tested. Therefore, integration testing is critical part of quality assurance that focuses on the prevention of integration bugs and reduces the risk of the system not working efficiently and effectively.

In this study, the efficiency of existing component testing techniques was evaluated to find a suitable integration testing technique for component-based software that lacks specifications. Some of the existing techniques have their own limitations. Therefore, in this research, these testing techniques were extended to provide a more comprehensive testing technique that addresses these limitations. A methodology for component-based integration technique using architectural perspective has been proposed entitled "Connector-based Integration Testing for Component-based Systems"(*CITECB*). The proposed methodology has features for conducting component test order, analysing architectural test coverage of the connectors, modelling static and dynamic information of the component interactions and monitoring the progress of the test coverage.

Two of the CITECB methodology features were evaluated against existing relevant testing techniques. The results of the evaluations has shown that the component test order of this methodology surpassed the existing class test ordering methods in reducing the testing efforts by leading to a smaller number of stub creation. The test coverage criteria of CITECB methodology is a novel method for providing a better architectural test coverage by providing detailed information of the involved test elements, their test coverage and test suite precisions in achieving the test coverage values.

The value of this proposed methodology lies in complementing the existing white-box testing strategies by addressing the integration issues at the architectural level, which is not yet addressed by most of the white-box testing strategies. This methodology also complements the existing component-based testing strategies by addressing issues related to component test order and architectural level test coverage.