

An experimental assessment of module documentation-based testing.

ABSTRACT

Context: Testing a module that has memory using the black-box approach has been found to be expensive and relatively ineffective. Instead, testing without knowledge of the specifications (white-box approach) may not be effective in showing whether a program has been properly implemented as stated in its specifications. We propose instead a grey-box approach called Module Documentation-based Testing or MD-Test, the heart of which is an automatic generation of the test oracle from the external and internal views of the module. Objective: This paper presents an empirical analysis and comparison of MD-Test against three existing testing tools. Method: The experiment was conducted using a mutation-testing approach, in two phases that assess the capability of MD-Test in general and its capability of evaluating test results in particular. Results: The results of the general assessment indicate that MD-Test is more effective than the other three tools under comparison, where it is able to detect all faults. The second phase of the experiment, which is significant to this study, compares the capabilities of MD-Test and JUnit-black using the test evaluation results. Likewise, an analysis of the test evaluation results shows that MD-Test is more effective and efficient, where MD-Test is able to detect at least the same number of faults as, or is at par with, the black-box approach. Conclusion: It is concluded that test evaluation using grey-box approach is more effective and efficient than the black-box approach when testing a module that has memory.

Keyword: Specification-based testing; Grey-box testing; Automated module testing; Mutation-testing