Oracle-Centric Test Case Prioritization

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Abstract: Recent work in testing has demonstrated the benefits of considering test oracles in the testing process. Unfortunately, this work has focused primarily on developing techniques for generating test oracles, in particular techniques based on mutation testing. While effective for test case generation, existing research has not considered the impact of test oracles in the context of regression testing tasks. Of interest here is the problem of test case prioritization, in which a set of test cases are ordered to attempt to detect faults earlier and to improve the effectiveness of testing when the entire set cannot be executed. In this work, we propose a technique for prioritizing test cases that explicitly takes into account the impact of test oracles on the effectiveness of testing. Our technique operates by first capturing the flow of information from variable assignments to test oracles for each test case, and then prioritizing to "cover" variables using the shortest paths possible to a test oracle. As a result, we favor test orderings in which many variables impact the test oracle's result early in test execution. Our results demonstrate improvements in rate of fault detection relative to both random and structural coverage based prioritization techniques when applied to faulty versions of three synchronous reactive systems.