Regression Test Selection and Prioritization for Object-Oriented Programs

Chhabi Rani Panigrahi [09CS9704]

An effective regression test case prioritization technique for object-oriented programs needs to take into account dependencies arising due to object relations in addition to data and control dependencies. In this context, we propose a regression test case prioritization approach based on the coverage of number of affected nodes by a test case in the dependency model of object-oriented programs. We have also implemented our test case prioritization technique to realize a prototype tool. We have measured the effectiveness of our technique using a widely accepted metric called average percentage of faults detected (APFD). Our experimental studies show that the APFD metric values using our approach is on an average higher by 25.7% as compared to a related approach.

All existing approaches as well as our coverage based test case prioritization technique assume that error existing in a statement is exposed when it is executed with a test case. In this context, we propose a heuristic based test case prioritization approach which assumes that when a statement is executed with a test case the probability of detecting an error existing in that statement decreases. We have implemented our heuristic based prioritization technique in a prototype tool to measure the effectiveness of our approach. Our experimental results indicate that the APFD metric values using our heuristic based approach is on an average higher by 9.01% as compared to our coverage based approach.

During construction of dependency model, all program paths are considered to be feasible and dependencies are computed along all paths in its control flow graph model. The existence of infeasible paths may decrease the precision of static slices as it conservatively includes dependencies along all paths. By eliminating the dependencies computed along infeasible paths, the size of a computed slice can be reduced. This can result in improving the precision of static slices. In this context, we propose an approach to construct improved precise slices of object-oriented programs by computing dependencies only along feasible paths. Our experimental studies indicate that our approach reduces the slice size on an average by 6.16% as compared to a traditional approach using ESDG. Subsequently we apply our improved slicing approach to reduce the size of regression test suite of object-oriented programs. We have implemented our regression test selection technique in a prototype tool to measure the effectiveness of our approach. Our experimental results show that our approach reduces the size of regression test suite on an average by 11.25% as compared to a related approach.

Keywords: *Regression testing, Object-oriented programs, Slicing, Test case selection, Test case prioritization, Infeasible paths.*