

Implement Mirror adaptive random testing in TSTL

Project proposal for CS569: Static Analysis/Model Checking, spring 2016

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1 Project Description

Software testing is one of the most important methods to assure the quality of software. There exist some testing approaches which generate test cases in order to detect system failures. In these methods, random testing is a basic and wide-adopted one which just randomly pick objects from a set of all possible inputs, generate test cases and executing the program with those test cases. However, random testing were called “least effective” method by some people for using little information about the system under test in test case generation. That is the reason of people put forward the idea of Adaptive Random Testing, which is a method based on observations about failure patterns to improve the effectiveness of random testing. Although adaptive random testing does works as people supposed to improve the effectiveness, the additional computation it requires makes this method less cost-effective than basic Random Testing. In order to improve the cost-effectiveness of ART, researchers include T. Y. Chen and F. -C. Kuo provide a new technique, called ‘mirror ART’, which combines the technique of mirroring and ART to reduces computations. It is known that there is an important concept in software testing called test suite, a set of test cases selected by using some selection strategy. Since the process of generating a test case for the test suit is computationally expensive, it may not always feasible to construct a complete test suite. That is why the technique of mirroring is implemented, which would, instead of construct a complete suite case, use less computations to construct an approximate test suite to also satisfy the testing objective. Mirror partitioning is one of the components of mirroring, which would determine how to divide input domain into disjoint subdomains. One of those disjoint subdomains is designated as the source subdomain while others are mirror subdomains. Test cases would only generated by test case selection process in those source subdomains. And then, another important component of mirroring, mirror function, would applied to the test cases that generated to yield other test cases in the mirror subdomains. In this term, I would tried to implement this M-ART method in the test generator in TSTL to improve its effectiveness.

2 Project plan

My plan for this project is:

- Apr 20 - Apr 24: Find and read papers on Random Testing (RT), Adaptive Random Testing (ART) and Mirroring. In this phase, I would concentrate on investigate relative works and the basic principle of TSTL to prepare for the implementation.

- Apr 25 - May 3: Understand the APIs of TSTL and implement some basic features of the M-ART method to work with TSTL.
- May 3 - May 18: improve the implementation of test generator. Finishing the main part of coding work in this phase.
- May 18 – June 6: revise the code, finishing all document works.

3 relevant papers

[1] Tsong Yueh Chen, Fei-Ching Kuo, Robert. G. Merkel, S. P. NG Mirror adaptive random testing. 2004

[2] Tsong Yueh Chen, Fei-Ching Kuo, Robert. G. Merkel, T. H. Tse Adaptive Random Testing: The ART of test case diversity. 2010