CS569
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Project Proposal

Feedback-directed Random Test Generation

Introduction

In software testing method, random testing is can be used to supplement functional testing. It mainly according to the tester's experience in checking functionality and performance for a software. Random testing can retest models not been covered by test cases in a software. It also can be used in testing new features in a software. The key points are checking special circumstances points, the special usage of the environment , and concurrency. Usually each of the test versions of software need to perform random testing, especially for the final version, it should pay more attention.

Background and algorithm

There are some algorithms to support random testing method, and they can help testers to reach their goal: tracking the operation steps, simplify the defect, and repro actions. Here I'd like to use Feedback-directed test method to do random testing. Feedback-directed test method is a technique that improves random test generation. It can outperform systematic and undirected random test generation, in terms of coverage and error detection [1]. In its algorithm, it takes four inputs: a list of classes for which to create sequences, a list of contracts, a list of filters, and a time limit, then generate a data sequence. This sequence can be executed and get the flag value equals to redundant or illegal, and then creating a new sequence. The algorithm checks two sequences are equivalent if they translate to the same code, modulo variable names, if it is, then the algorithm will generate a new sequence again, and repect these steps. If it returns satisfied or violated, then we can get the test result.

Project plan

In order to understand more about Feedback-directed generation, I will read paper "Feedback-directed Random Test Generation" by C.Pacheco el. and use try to represent the method with TSTL. TSTL is a very useful testing tool, which support various ways in testing area. It running based on Python, and has clearly synax and rich semantics. Thus I'm going to read paper "TSTL: The Template Scripting Testing Language" by A.Groce el. The benefit of Feedback-directed random test is it can avoid redundant and illegal generation, such that it has high performance than normal random testing method. In TSTL, one way I may do is

insert python code by “<%%>”, or key word “import”, then implement new features in python code call by TSTL.
Also, in the class we have a test example “AVLtree”, in Feedback-directed generation, it also contains data structure. Our class example may give hints to rewrite the method in TSTL.

Reference

[1] C. Pacheco, S. K. Lahiri, M. D. Ernst, and T. Ball, “Feedback-Directed Random Test Generation,” *29th International Conference on Software Engineering (ICSE'07)*, 2007.
[2] A. Groce, J. Pinto, P. Azimi, and P. Mittal, “TSTL: a language and tool for testing (demo),” Proceedings of the 2015 International Symposium on Software Testing and Analysis - ISSTA 2015, 2015.
[3] A. Groce and J. Pinto, “A Little Language for Testing,” *Lecture Notes in Computer Science NASA Formal Methods*, pp. 204–218, 2015.