A parameterized unit test framework based on symbolic Java PathFinder

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Abstract: Parameterized unit test recently gains a lot of attention as it saves testing cost and is more efficient in term of code coverage. We present a framework for running parameterized unit tests (PUT) based on Java PathFinder (JPF) and JUnit. Our approach bases on model checking and symbolic execution of JPF for generating standard unit tests. As a result, we achieve high structural and path coverage. The generated unit tests are automatically executed by JUnit so programmers receive immediately assertion failures if any. Currently, our approach mainly works with numeric and boolean data type but it is possible to extend our framework for other data types such as string. ?? 2009 IEEE.
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Index Keywords: Code coverage; Data type; Java PathFinder; Parameterized; Path coverage; Symbolic execution; Unit tests; Knowledge engineering; Model checking; Parameterization; Systems engineering; Testing; Automatic test pattern generation

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References:

1. Beizer, B., (1990) Software Testing Techniques, , Van Nostrand Reinhold Co., New York, NY, USA, 2nd edition
2. Pasareanu, C., Combining unit-level symbolic execution and system-level concrete execution for testing NASA software ISSTA'08 Paper
3. Kroening, D., Strichman, O., Decision Procedures: An Algorithm Point of View, , ?? 2008 Springer-Verlag Berlin Heidelberg2008
4. Clarke, E.M., Grumberg, O., Peled, D.A., (2000) "Model Checking, , The MIT Press, January
5. Zhu, H., Hall, P., May, J., (1997) Software Unit Test Coverage and Adequacy. ACM Computing Surveys, 29 (4), pp. 366-427. , ISSN 0360-0300, December
6. King, J.C., Symbolic execution and program testing (1976) Communications of the ACM, 19 (7), pp. 385-394
7. De Halleux, J., Tillmann, N., Parameterized unit testing with pex (tutorial) (2008) Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), pp. 171-181. , DOI 10.1007/978-3-540-79124-9-12, Tests and Proofs - Second International Conference, TAP 2008, Proceedings
8. Edvardsson, J., (2006) Techniques for Automatic Generation of Tests from Programs and Specifications, , Department of Computer and Information Science, Linkoping SE-581, Sweden
9. K??hk??nen, K., (2007) Evaluation of Java PathFinder Symbolic Execution Extension, , June
10. Michael, C.C., McGraw, G.E., Schatz, M.A., Walton, C.C., Genetic algorithms for dynamic test data generation (1997) Automated Software Engineering, 1997, Proceedings., 12th IEEE International Conference, pp. 307-308. , 1-5 Nov
11. Tillmann, N., Schulte, W., Unit tests reloaded: Parameterized unit testing with symbolic execution (2006) IEEE Software, 23 (4), pp. 38-47
12. Tillmann, N., Schulte, W., Parameterized unit tests (2005) ESEC/FSE'05 - Proceedings of the Joint 10th European Software Engineering Conference (ESEC) and 13th ACM SIGSOFT Symposium on the Foundations of Software Engineering (FSE-13), pp. 253-262. , ESEC/FSE'05 - Proceedings of the Joint 10th European Software Engineering Conference (ESEC) and 13th ACM SIGSOFT Symposium on the Foundations of Software Engineering (FSE-13)
13. Godefroid, P., Compositional dynamic test generation (2007) ACM SIGPLAN Notices, 42 (1), pp. 47-54. , http://delivery.acm.org/10.1145/1200000/1190226/p47-godefroid.pdf?key1=1190226&key2=6339069611&coll=portal&dl=ACM&CFID= 57809500&CFTOKEN=27978298
14. Godefroid, P., Klarlund, N., Dart, K.S., Directed automated random testing (2005) Proceedings of the ACM SIGPLAN 2005 Conference on programming Language Design and Implementation (PLDI), pp. 213-223. , ACM
15. De Halleux, P., Tillmann, N., (2008) Parameterized Test Patterns For Effective Testing with Pex, , Copyright Microsoft Corporation. October 21
16. Ihantola, P., (2006) Automatic Test Data Generation for Programming Exercises Withsymbolic Execution and Java PathFinder, , Master's thesis, Helsinki University of Technology, Departement of Theoretical Computer Science
17. Vall??e-Rai, R., Co, P., Gagnon, E., Hendren, L.J., Lam, P., Soot, V.S., A Java bytecode optimization framework (1999) Proceedings of the 1999 conference of the Centre for Advanced Studies on Collaborative Research (CASCON), p. 13. , IBM
18. Anand, S., Godefroid, P., Tillmann, N., Demand-driven compositional symbolic execution (2008) Proc. of TACAS'08, pp. 367-381. , volume 4963 of LNCS, Springer
19. Khurshid, S., Pasareanu, C.S., Visser, W., Generalized Symbolic Execution for Model Checking and Testing (2003) LECTURE NOTES IN COMPUTER SCIENCE, (2619), pp. 553-568. , Tools and Algorithms for the Construction and Analysis of Systems
20. Anand, S., Pasareanu, C.S., Visser, W., JPF-SE: A symbolic execution extension to Java pathfinder (2007) Lecture Notes in

Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), pp. 134-138. , Tools and Algorithms for the Construction and Analysis of Systems - 13th International Conference, TACAS 2007. Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2007

21. Visser, W., Pasareanu, C.S., Khurshid, S., Test input generation with Java PathFinder (2004) ISSTA 2004 - Proceedings of the ACM SIGSOFT International Symposium on Software Testing and Analysis, pp. 97-107. , ISSTA 2004 - Proceedings of the ACM SIGSOFT International Symposium on Software Testing and Analysis