Java PathFinder
A Translator from Java to Promela

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Java PathFinder [2], Jpf, is a prototype translator from Java to Promela, the modeling language of the Spin model checker [4]. Jpf is a product of a major effort by the Automated Software Engineering group at NASA Ames to make model checking technology part of the software process. Experience has shown that severe bugs can be found in final code using this technique [1], and that automated translation from a programming language to a modeling language like Promela can help reducing the effort required.

Jpf allows a programmer to annotate his Java program with assertions and verify them using the Spin model checker. In addition, deadlocks can be identified. An assertion is written as a call to an `assert` method defined in a predefined Java class, the `Verify` class. The argument to the method is a boolean Java expression over the state variables. The `Verify` class contains additional temporal logic methods which allow to state temporal logic properties about static variables. Hence Java itself is used as the specification language. An application of Jpf is described elsewhere in the proceedings [3].

A respectable subset of Java is covered by Jpf, including dynamic object creation, object references as first class citizens, inheritance, exceptions, interrupts, and perhaps most importantly: thread operations. Among major concepts not translated are: packages, method overloading and overriding, method recursion, strings, and floating point numbers. Finally, the class library is not translated.

References

1. K. Havelund, M. Lowry, and J. Penix. Formal Analysis of a Space Craft Controller using SPIN. In G. Holzmann, E. Najm, and A. Serhrouchni, editors, *Proceedings of the 4th SPIN workshop, Paris, France*, November 1998. To appear in IEEE Transactions of Software Engineering.
2. K. Havelund and T. Pressburger. Model Checking Java Programs using Java PathFinder. Appearing in *International Journal on Software Tools for Technology Transfer* (STTT), 1999.
3. K. Havelund and J. Skakkebæk. Applying Model Checking in Java Verification. In R. Gerth, G. Holzmann, and S. Leue, editors, *Proceedings of the 6th SPIN workshop (these proceedings), Toulouse, France*, September 1999.
4. G. Holzmann. *The Design and Validation of Computer Protocols*. Prentice Hall, 1991.