AccuLock: Accurate and Efficient Detection of Data Races

ABSTRACT

The ubiquity of multicore processors is clearly increasing software complexity by driving the need for multithreaded applications. Unfortunately, data races often introduce serious hard-to-find, crash-causing concurrency-related software defects.

In this talk, I will introduce a new dynamic data race detector, AccuLock, that we have recently developed for detecting data races in multithreaded Java programs. AccuLock analyzes a program by reasoning about a subset of happens-before relation (with lock acquires and releases excluded), thereby reducing its sensitivity to thread interleaving. When such a weaker happens-before relation is violated, AccuLock applies a new efficient lockset algorithm to enforce a lock-based synchronization discipline by distinguishing the locks protecting reads and writes. The key motivation behind is to ensure that AccuLock can improve happens-before detectors by discovering also data races in alternate thread interleavings when analyzing one program execution while limiting false warnings thus incurred in a controlled manner. In addition, AccuLock achieves these objectives by maintaining comparable performance as FastTrack, the fastest happens-before detector currently available.

I will conclude my talk with some experimental results by comparing AccuLock with six other detectors, all implemented in Jikes RVM using Java benchmark programs.

BIOGRAPHY

Jingling Xue received his BSc and MSc degrees in Computer Science and Engineering from Tsinghua University in 1984 and 1987, respectively, and his PhD degree in Computer Science and Engineering from Edinburgh University in 1992. He is currently a Professor in the School of Computer Science and Engineering, University of New South Wales, Australia, where he heads the Programming Languages and Compilers Group.

Jingling Xue’s main research interest has been programming languages and compilers for about 20 years. He is currently supervising a group of postdocs and PhD students on a number of topics including programming and compiler techniques for multi-core processors and embedded systems, concurrent programming models, dynamic program analysis for bugs and security vulnerabilities, and automatic parallelization of programs for parallel and distributed systems.

Jingling Xue is presently an Associate Editor of IEEE Transactions on Computers, International Journal of Parallel, Emergent and Distributed Systems, and Journal of Computer Science and Technology.

All are welcome!

In case of questions, please contact Dr Jason Xue at Tel: 3442 9815, E-mail: jasonxue@cityu.edu.hk, or visit the CS Departmental Seminar Web at http://www.cs.cityu.edu.hk/.