

# Testing Multithreaded Programs as if They were Sequential



## Prof. Zijiang James Yang

Professor  
Department of Computer Science  
Western Michigan University  
USA

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Time : 10:30 a.m. – 11:30 p.m.

Venue : Room PQ703, 7/Floor, PQ Core, Mong Man Wai Building,  
The Hong Kong Polytechnic University

### ► Abstract

Developing multithreaded software is challenging because the basic assumption underlies sequential software testing -- the program behavior is deterministic under fixed inputs -- is no longer valid due to the nondeterminism brought by thread scheduling. In this talk, we present a proactive testing approach to restore this basic assumption so that programmers can test multithreaded programs as if they were sequential. Our approach is based on a synergistic integration of symbolic analysis and dynamic analysis techniques. In particular, symbolic analysis is used to predict program behavior under multiple thread interleavings and drive automated executions further. Dynamic analysis is used to explore executions with new instructions and guide symbolic analysis further. The net effect is a systematic and complete coverage of the program behaviors under a fixed input vector. We have implemented the proposed method in a software tool. Our experiments show that the new method outperforms both ESBMC and Maple, two state-of-the-art testing tools for multithreaded programs, in terms of efficiency.

### ► About the Speaker

James Yang is a professor of Computer Science at Western Michigan University. His research is in the broad areas of software engineering and formal methods. The primary focus is to develop formal method based tools to support the debugging, analysis and verification of complex systems. He has published over seventy referred conference and journal papers. He is also an inventor of ten United States patents. James Yang received his Ph.D. under the supervision of Prof. Rajeev Alur from the University of Pennsylvania, M.S. under the supervision of Prof. Moshe Vardi from Rice University, and B.S. from the University of Science and Technology of China, all in computer science. He was a recipient of the 2015 CEAS outstanding researcher award, 2010 PADTAD best paper award, 2008 ACM TODAES best paper award and the 2008 CEAS outstanding new researcher award. He was a visiting professor at EECS, University of Michigan from 2009 to 2013. Prof Yang is a senior member of the Institute of Electrical and Electronics Engineering (IEEE).

**All are welcome!**

Enquiries:

Professor George Baciu

Email: [csgeorge@comp.polyu.edu.hk](mailto:csgeorge@comp.polyu.edu.hk)

Tel : 2766 7295 / 2766 7272

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