Debugging Concurrent Programs
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1. ABSTRACT
Detecting errors in concurrent programs is a notoriously difficult task. A key reason for this is the behavioral complexity resulting from the large number of interleavings of different threads. This exacerbates the state-explosion problem thereby rendering a full-fledged state space exploration of concurrent programs hard.

Traditionally, verification of concurrent software has focused on using explicit-state model checking techniques for state-space exploration while relying on partial order reduction (POR) to isolate a subset of thread interleavings that need be considered without sacrificing precision. These techniques, however, do not exploit the power of symbolic methods, i.e., the use of of SAT/SMT solvers, to efficiently explore large state spaces. We discuss recent advances in integrating POR with symbolic search which then enables us to leverage the power of both techniques in combating state explosion.

While symbolic-POR techniques go a long way in ameliorating the state explosion problem, they still do not enable a full-fledged exploration of statespace of real-life concurrent programs. We next discuss trace-based or runtime error detection techniques which have appeared in top conferences in the field. At the University of Texas, Vineet Kahlon developed new techniques for reasoning about parameterized and infinite state systems. At NEC Labs, he has contributed to the development of a software verification tool called F-Soft and a concurrent software debugging tool called CoBe. He is the recipient of NEC Laboratories SEEDS and Technology Commercialization Awards. Vineet Kahlon has served on program committees of leading conferences and also co-organized the EC2 workshops on Exploiting Concurrency Efficiently and Correctly in 2008-2009.

2. SPEAKER BIOGRAPHY
Vineet Kahlon is a Research Staff Member at NEC Laboratories in Princeton, N.J. He received his BTech degree (1997) from Indian Institute of Technology, Kanpur, (India) and his M.S. (1999) and PhD. (2004) degrees from the University of Texas at Austin where he was awarded the MCD fellowship. He joined NEC in August 2004. Vineet Kahlon's research interests include Automated Verification, Software Engineering, Programming Languages, and Embedded Systems with a focus on the analysis of concurrent programs. He has made important contributions to model checking, dataflow analysis and predictive analysis of concurrent programs many of which have appeared in top conferences in the field.