Portable Non-blocking Data Structures

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Date and Time: March 18 (Monday), 2013 - 11:00am-12:00pm

Location: 3437 SEC

Abstract:
Multi-core architectures are common on personal computers and mobile devices. The number of available cores is bound to increase rapidly in the foreseeable future. Utilizing the potential parallel processing power provided by the hardware is a major challenge in modern software engineering. Programming parallel software is difficult because concurrency entails many hazards including race conditions, deadlocks, livelocks, order violations, and atomicity violations.

In this talk we will introduce the non-blocking programming paradigm as an alternative for programming multi-core systems. Non-blocking programming avoids many of the mentioned concurrency hazards, while retaining a large degree of parallelism. We will present non-blocking implementations of common data structures, such as a resizable array and a bounded queue. Our evaluation against known blocking and hybrid alternatives demonstrates that the performance of our implementations is competitive. The presented data-structures are portable because we rely only on the C1x/C++11 concurrency model, which offers programmers fine-grained control over data synchronization. A brief overview of the C++11 concurrency model will also be given.

Biography:
Dr. Peter Pirkelbauer is an assistant professor at the University of Alabama at Birmingham. He received his PhD from Texas A&M University in 2010, where he was a member of Dr. Stroustrup's research group. He also was a post-doctoral researcher in Dr. Quinlan's ROSE compiler group at the Lawrence Livermore National Laboratory. His current projects include scalable runtime error detection in parallel systems and the development of scalable and portable non-blocking data structures. His research interests include programming languages, source code analysis, transformation systems, and non-blocking programming techniques.