6.895 Theory of Parallel Systems Lecture 0

Project Proposal

Lecturer: Charles Leiserson *Scribe: Xie Yong*

1 Background

The current Cilk system (version 5.3) makes use of locks to achieve atomicity, but there are several well-know problems associated with locks such as prority inversion, convoying, deadlock, and etc. One way to avoid using locks is to use lock-free data-structure. Lots of researchers have inverstigated techniques for implementing lock-free convurrent data structures using software techniques, but software implmentations of lock-free data structures often do not perform as well as their locking-based counterparts. Herligy and Moss [1] proposed *transactionalmemory* as a way to ease the writing of concurrent programs. It allows a program to read and modify multiple, disparate memory locations as a single atomic operation, and avoids the problems related to locks. The authors also claimed the efficiency of transactional memory on a prototype based on a cache-consistency mechanism.

2 Idea

The idea of *transactioneverywhere* [2] was proposed by Prof. Leiserson, but in order to incorporate transactional memory into Cilk, there are several challenges, like detecting data races and so on. In this project, I plan to build some tools for Cilk like "nondeterminator for transactional memory". So far, I have not seen any well-defined transactional memory model for Cilk, and I am still reading papers, and exploring what kind of transactional memory model is suitable for Cilk in order to allow efficient algorithmic detection of data races. I need to refine my proposal after I can read some thesis (e.g. Kai's) in this area.

3 Plan

Currently, this project is still at its starting phase, and I expect to have a detailed specification of what needs to done by next week, as I have just received the material to read.

References

[1] M. Herlihy and J. E. B. Moss. Transactional memory: Architectural support for lock-free data structures. In *Proceedings of theTwentiethAnnual International Symposium on Computer Architecture*, 1993.

[2] Charles E. Leiserson. Personal communication. Cambridge, Massachusetts, 2002.