COMPUTER SCIENCE DEPARTMENT
UNIVERSITY OF MARYLAND-COLLEGE PARK

CMSC 818J (Spring 1995) **Jeff Hollingsworth**

Tools for the Measurement and Debugging of Parallel Programs

This is the list of readings for CMSC 818J, and the approximate order in which we will read them. The typical reading load will be one paper per class. The class will also include one written exam, and a substantial project.

1. Background and Motivation

(1) J. H. Saltzer, D. P. Reed, and D. D. Clark, ‘‘End-To-End Arguments in System Design,’’ *ACM Trans. on Computer Systems* **2**, 4, pp. 277-288, November 1984.

(2) Cherri M. Pancake and Curtis Cook, ‘‘What Users Need in Parallel Tools Support: Survey Results and Analysis,’’ *1994 Scalable High-Performance Computing Conference*, pp. 40-47, Knoxville, TN, May 1994.

2. Languages for Parallel Programming

(3) V. S. Sunderam, Al Geist, Jack Dongarra, and Robert Manchek, ‘‘The PVM Concurrent Computing System: Evolution, Experiences, and Trends,’’ *Parallel Computing*, (to appear).

(4) N. Carriero and D. Gelernter, ‘‘Linda in context,’’ *Communications of the ACM* **32**, 4, pp. 444-58, April 1989.

(5) Z. Bozkus, A. Choudhary, G. Fox, T. Haupt, and S. Ranka, *Compiling HPF for Distributed Memory MIMD Computers*, (to appear)

(6) D. E. Culler, A. Dusseau, Seth Copen Goldstiend, A. Krishnamurthy, Steven Lumetta, T. von Eicken, and K. Yelick, ‘‘Parallel Programming Using Split-C,’’ *Supercomputing ’93*, pp. 262-273, Nov. 1993.

3. Performance Metrics

(7) Susan L. Graham, Peter B. Kessler, and Marshall K. McKusick, ‘‘gprof: a Call Graph Execution Profiler,’’ *SIGPLAN ’82 Symposium on Compiler Construction*, pp. 120-126, June 1982.

(8) C.-Q. Yang and B. P. Miller, ‘‘Critical Path Analysis for the Execution of Parallel and Distributed Programs,’’ *8th Int’l Conf. on Distributed Computing Systems*, pp. 366-375, June 1988.

(9) Aaron J Goldberg and John L. Hennessy, ‘‘Performance Debugging Shared Memory Multiprocessor Programs with MTOOL,’’ *Supercomputing’91*, pp. 481-490, NOV 18-22, 1991.

(10) Jeffrey K. Hollingsworth and Barton P. Miller, ‘‘Parallel Program Performance Metrics: A Comparison and Validation,’’ *Supercomputing 1992*, pp. 4-13, November 1992.

4. Search Based Performance Tools

(11) James Kohn and Winifred Williams, ‘‘ATExpert,’’ *Journal of Parallel and Distributed Computing* **18**, 2, pp. 205-222, June 1993.

(12) Sharon E. Perl and William E. Weihl, ‘‘Performance Assertion Checking,’’ *14th ACM Symposium on Operating Systems Principles*, pp. 134-145, Asheville, NC, December 5-8, 1993.

(13) Jeffrey K. Hollingsworth and Barton P. Miller, ‘‘Dynamic Control of Performance Monitoring on Large Scale Parallel Systems,’’ *7th ACM International Conf. on Supercomputing*, pp. 185-194, July 1993.

5. Visualization

(14) M T. Heath and J. A. Etheridge, ‘‘Visualizing Performance of Parallel Programs,’’ *IEEE Software* **8**, 5, Sept 1991.

(15) Daniel A. Reed, Ruth A. Aydt, Roger J. Noe, Phillip C. Roth, Keith A. Shields, Bradley W. Schwartz, and Luis F. Tavera, ‘‘Scalable Performance Analysis: The Pablo Performance Analysis Environment,’’ in *Scalable Parallel Libraries Conference*, ed. Anthony Skjellum, IEEE Computer Society 1993.

(16) Joan M Francioni, Larry Albright, and Jay Alan Jackson, ‘‘Debugging Parallel Programs Using Sound,’’ *1991 ACM/ONR Workshop on Parallel and Distributed Debugging*, pp. 68-75, May 20-21, 1991. appears as SIGPLAN, December 1991

6. Data Collection

(17) Gene Mcdaniel, ‘‘METRIC: a kernel instrumentation system for distributed environments,’’ *6th SOSP*, pp. 93-99, November 1977.

(18) James R. Larus, ‘‘Abstract Execution: A Technique for Efficiently Tracing Programs,’’ *SPE* **20**, 12, pp. 1241-1258, Dec 1990.

(19) Alan Mink, Robert Carpenter, George Nacht, and John Roberts, ‘‘Multiprocessor Performance Measurement Instrumentation,’’ *IEEE Computer* **23**, 9, pp. 63-75, September 1990.

(20) Jeffrey K. Hollingsworth, Barton P. Miller, and Jon Cargille, ‘‘Dynamic Program Instrumentation for Scalable Performance Tools,’’ *1994 Scalable High-Performance Computing Conf.*, 1994.

7. Performance Prediction

(21) Mark J. Clement and Michael J. Quinn, ‘‘Analytical Performance Prediction on Multicomputers,’’ *Proceedings of Supercomputing ’93*, pp. 886-894, Nov 1993.

(22) V. Balasundaram, G. Fox , K. Kennedy , and U. Kremer, ‘‘A Static Performance Estimator to Guide Data Partitioning Decisions,’’ *Proceedings of PPoPP 91*, pp. 213--223, 1991.

(23) Mark E. Crovella and Thomas J. LeBlanc, ‘‘Parallel Performance Prediction Using Lost Cycles Analysis,’’ *Proceedings of Supercomputing ’94*, 1994.

8. Correctness Debuggers

(24) F. Baiardi, N. De Francesco, E. Matteoli, S. Stefanini, and G. Vaglini, ‘‘Development of a Debugger for a Concurrent Language,’’ *Proc. of the 5th Int’l Conf. on Distributed Computing Systems*, pp. 98-106, May 1985.

(25) Peter Bates and Jack C. Wileden, ‘‘An Approach to High-Level Debugging of Distributed Systems,’’ *Proc. of the 5th Int’l Conf. on Distributed Computing Systems*, pp. 107-111, May 1985.

(26) D. D. Redell, ‘‘Experience with Topaz TeleDebugging,’’ *Proc. of the SIGPLAN/SIGOPS Workshop on Parallel and Distributed Debugging*, pp. 35-44, May 1988. Appears as *SIGPLAN Notices* **24**, 1 (January 1989).

9. Events and their Order

(27) K. M. Chandy and L. Lamport, ‘‘Distributed Snapshots: Determining Global States of Distributed Systems,’’ *ACM Trans. on Computer Systems* **3**, 1, pp. 63-75, February 1985.

(28) B.P. Miller and J-D. Choi, ‘‘Breakpoints and Halting in Distributed Programs,’’ *Proc. of the 8th Int'l Conf. on Distributed Computing Systems*, pp. 316-323, June 1988.

(29) Allen D. Malony, Daniel A. Reed, and Harry A. G. Wijshoff, ‘‘Performance Measurement Intrusion and Pertubation Analysis,’’ *IEEE Trans. on Parallel and Distributed Systems* **3**, 4, pp. 433-450, July 1992.

10. Race Detection

(30) Thomas J LeBlanc and John M Mellor-Crummey, ‘‘Debugging Parallel Programs with Instant Replay,’’ *IEEE Transactions on Computers* **36**, 4, pp. 471-482, April 1987.

(31) Emrath, Ghosh, and Padua, ‘‘Detecting Non-determinacy in parallel programs,’’ *IEEE Software* , Jan 1992.

(32) R. B. Netzer and B. P. Miller, ‘‘What Are Race Conditions?,’’ *ACM LOPLAS* **1**, 1, pp. 74-88, March 1992.

11. Performance Steering

(33) G. Eisenhauer, K. Schwan, Weiming Gu, and N. Mallavarupu, *Falcon-toward interactive parallel programs: the on-line steering of a molecular dynamics application.,* Proceedings of the Third IEEE International Symposium on High Performance Distributed Computing , San Francisco 2-5 Aug. 1994.