PARALLEL COMPUTING

Summary Semester 2007

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Research Institute for Symbolic Computation (RISC)

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Topics

Application of concurrency to speed-up computations.

- Multi-core processors, multi-processor systems, computer clusters, computational grids.
- Shared memory (multi-threaded) and distributed memory (message passing) programming.
- Task parallel and data parallel algorithms.
- Strategies for parallel program design.
- Performance measures and complexity models.
- Performance analysis and debugging.

Various interrelated aspects (many of which we will discuss).

Preliminary Schedule

- March 7 (Schreiner): Parallel Computing
  — Architectures and Performance
- March 14 (Biere): Parallel Algorithms and Complexity
- March 21 (Schreiner): High Level Shared Memory Programming
  — OpenMP and Java
- April 4 (Biere): Low Level Shared Memory Programming
  — PThreads 1
- April 25 (Biere): Low Level Shared Memory Programming
  — PThreads 2
- May 9 (Schreiner): Designing Parallel Programs
- May 16 (Biere): Task Parallelism with Cilk
- May 30 (Schreiner): Message Passing Programming with MPI

Individual meetings for discussing/presenting the assignments.

Organization and Grades

- Moodle Course
  - Materials and links.
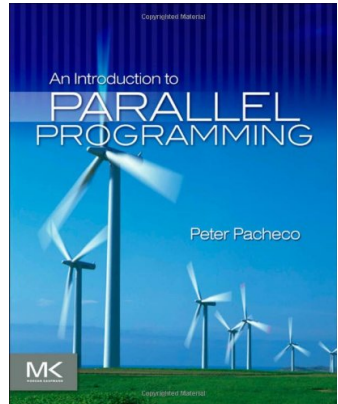 - Forums for announcements and Q&A.
  - Submission of assignments.
- Assignments
  - 4 programming assignments will be handed out.
  - At least 3 have to be turned in and graded positively.
  - Elaboration individually or in groups of twos.
  - Selected submissions will be invited for presentation.

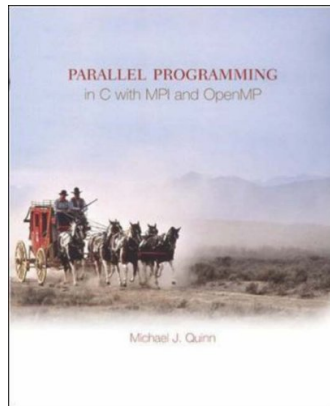No exam, grade will be entirely based on assignments/presentations.

Literature

Peter Pacheco, *An Introduction
to Parallel Programming*,
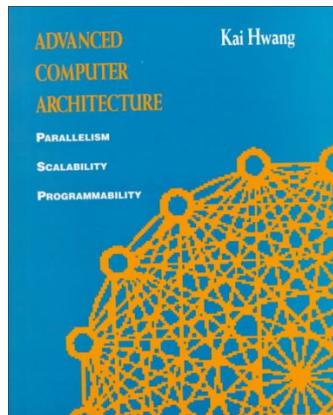Morgan Kaufmann, 2011.

Literature

Michael J. Quinn, *Parallel Programming in C with with MPI and OpenMP*, McGraw-Hill, 2003.
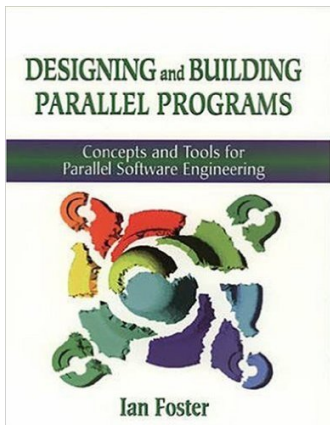
Literature

Kai Hwang, *Advanced Computer Architecture — Parallelism, Scalability, Programmability*, McGraw-Hill, 1993.

Literature

Ian Foster, *Designing and Building Parallel Programs*, Addison-Wesley, 1995.

Free online version at `http://www.mcs.anl.gov/~itf/dbpp`.