

PARALLEL COMPUTING

Summer Semester 2018



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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 6 (Biere): Parallel Algorithms and Complexity
- March 13 (Schreiner): Parallel Architectures and Performance
- March 20 (Schreiner): Shared Mem. Prog. with OpenMP/Java
- April 10 (Biere): Shared Memory Programming with PThreads 1
- April 17 (Schreiner): Presentations of Solutions 1
- April 24 (Biere): Shared Memory Programming with PThreads 2
- May 8 (Biere): Shared Mem. Prog. with Cilk, Work Stealing
- May 15 (Schreiner): Message Passing Programming with MPI
- May 22 (Biere): Presentations of Solutions 2
- May 29 (Schreiner): Designing Parallel Programs
- June 26 (Biere/Schreiner): Presentations of Solutions 3/4

Individual meetings for discussing/presenting the assignments.

Organization and Grades

■ Moodle Course

- Materials and links.
- Forums for announcements and Q&A.
- Submission of assignments.

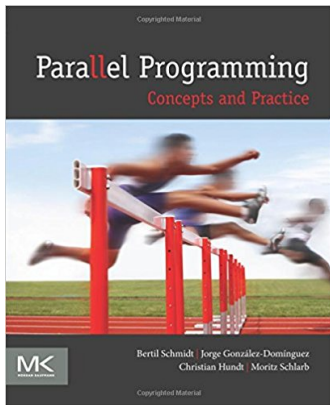
■ Assignments

- 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.

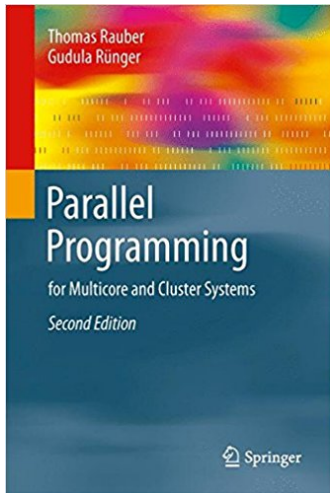
Literature

Bertil Schmidt et al. *Parallel Programming: Concepts and Practice*, Morgan Kaufmann, 2017.



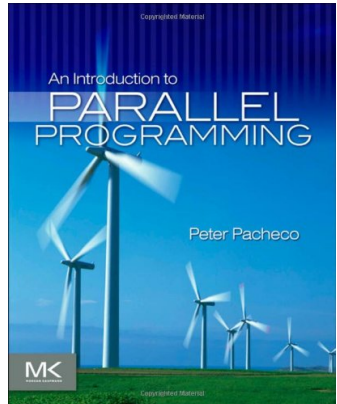
Literature

Thomas Rauber and Gudula Runger, *Parallel Programming: for Multicore and Cluster Systems*, Second Edition, Springer, 2013.



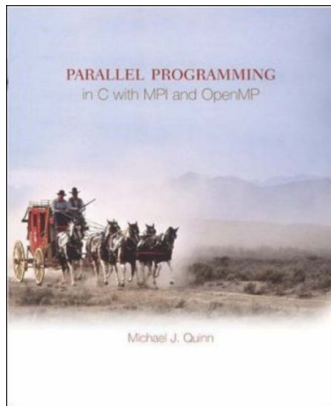
Literature

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



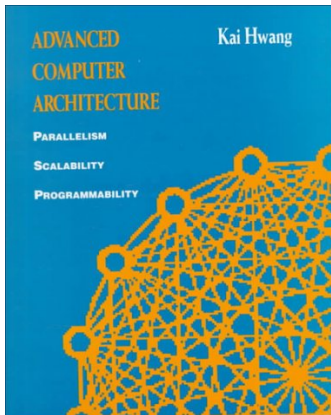
Literature

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



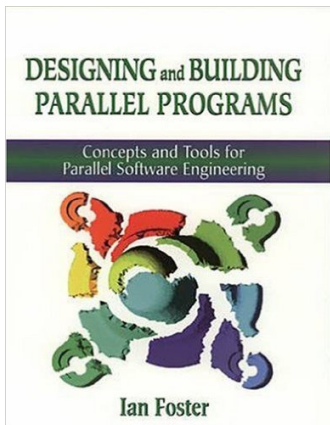
Literature

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>.