Winter 2008

CEG 820-01: Computer Architecture II

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Description: Continuation of CEG720 with more details on multiprocessor systems, parallel processing, and performance analysis.

Prerequisite: CEG720 or an equivalent course.

Instructor: Dr. Soon M. Chung
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403 Russ Engineering Center, 775-5119

Class: M. W. 4:10-5:25 p.m. at 054 Rike Hall

Office hour: M. W. 2:30-3:30 p.m. at 403 Russ Center
or by appointment.
* use e-mail for short questions.


Topics: Vectorization and vector processing methods
SIMD processing algorithms
Multiprocessor architecture and interconnects (Sec 7.1)
Multicache coherence algorithms (Sec 7.2)
Message-passing architecture and routing mechanism (Sec 7.3, 7.4)
Systolic array
Reconfigurable processor array
Conditions of parallelism (Sec 2.1)
Performance metrics (Sec 3.1.3)
Data flow computers (Sec 9.5)
Parallel language constructs (Sec 10.2)
Program partitioning and multiprocessor scheduling (Sec 2.2)

Grading: A: [85,100], B: [75,85), C: [65,75), D: [55,65), F: [0,55)

Midterm 25% (Feb. 13, Open book, note, and handouts)
Final 40% (Mar. 17, 5:45-7:45 p.m., Open book, note, and handouts)
Project 35%
{ originality 10%
organization of the report 5%
class presentation 10%
discussion 10% }
CEG 820 Project

- Choose a topic, and do either A or B.
A. Design, implementation, and/or performance analysis (deterministic modeling, analytical modeling, or simulation).
B. Technical paper review. (B is an incomplete form of A, and will get 70% of the score at maximum).

- Submit a description of your topic and a list of reference papers. (due 2/18)
- Present in the class and submit the report (report due 3/17)
- Size of the report is between 20 and 30 double-spaced pages.

Possible Topics

• Memory/cache management in multiprocessor system.
• MIMD machines
• Fault tolerant computing
• Parallel algorithms for numeric or nonnumeric computation.
• Performance evaluation of parallel computers
• Interconnection networks
• Dataflow machines
• Systolic array
• Optical computing
• Application-specific architectures, such as database machines, Image processing machine, etc.
• Artificial neural networks
• RAID (Redundant Array of Inexpensive Disks)
• Network switches
• Multimedia Systems
• Cluster computing
• Grid computing
• Other relevant topics

Reference Sources
- IEEE Trans. on Computer
- Computer (IEEE Computer Magazine)
- Communications of ACM
- IEEE Tutorials, such as Tutorial on computer architecture, on supercomputing, etc.
- Proc. of Int’l Conf. on Parallel Processing
- Proc. of Int’l Symposium on Computer Architecture: available in the volumes of Computer Architecture News
- Journal of Parallel and Distributed Computing
- ACM Trans. on Computer Systems
- IEEE Trans. on Parallel and Distributed Systems
- ACM Computing Surveys
- IEEE Trans. on Knowledge and Data Engineering
- IEEE Trans. on Neural Networks
- IEEE Micro
- ACM/Springer Multimedia Systems
- IEEE Multimedia
and Others