CS/ECE 752: Advanced Computer Architecture I

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TERM PROJECT

Project Proposal due in Class Tuesday, 01 April 1993.
Project Report due in Class Thursday, 06 May 1993.
Weight: 25%

The default project is to do some original research in a group of three students. For example, you could examine a modest extension to a paper studied in class or simply re-validate the data in some paper by writing your own simulator.

You will be graded on how well you define your problem, survey previous work, design and conduct experiments, and present your results. The goal to shoot for is *conference paper*, like the ones in your reader. Since time is limited, however, the above goal is hard to reach, and I will reward those that aim high even if they do not completely succeed. The key is insuring that some aspects of your work are completely done; it is very hard to grade a project where the simulator did not quite work. This type of project is especially recommended for students considering a Ph.D.

Alternatively, you may work in a group of two to write a paper that surveys an area within computer architecture. The paper should: (1) summarize work in an area, giving extensive references, (2) present opinions of others for and against various options (with references), and (3) conclude with *your opinion* of the strengths and weaknesses of arguments presented above. You will be graded on the completeness of your survey, the accuracy of your summaries, the support you give for your opinions, and the quality of your presentation. Since a survey paper is "safer" than a research project, I will hold survey papers to a higher standard of completeness and analysis of the literature.

I normally accept no late assignments. For this project, papers turned in after class but before 300P Friday will be accepted with a 25% penalty. Don't avail yourself of this option; your hard work deserves full credit.

Proposal

A project proposal should be turned in no later than April 1. Proposals turned in earlier will get earlier feedback. Proposals should be about one-two pages long. They should include: (1) a description of your topic , (2) a statement of why you think the topic is interesting or important, (3) (for projects with original research) a description of the methods you will use to evaluate your ideas, and (4) a references to at least three papers you have obtained. (The text and the papers we've read point to many papers. See also Proceedings of the International Symposium on Computer Architecture, Proceedings of the conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), IEEE Transactions on Computers, ACM Transactions on Computer Systems, and IEEE Computer.)

Report

Reports should consist of an abstract, body and optional appendices. The abstract should summarize the contributions of the report in one or two paragraphs. The length of the body should be the equivalent of 15-20 pages at double-spaced 10-point. Additional supporting material of any length can be put in appendices. I will read the body and only skim appendices.

Please turn over for topic suggestions.

Some Possible Research Topics

Study and conduct experiments (we have the SPEC benchmarks) to:

- evaluate the new proposed DRAM interfaces (e.g., RamBus and RamLink),
- analyze the effect of some instruction set enhancement (e.g., update-mode addressing, conditional register-to-register moves, and multiply-add instruction),
- design the successor to the Intel Pentium with a peak instructions per cycle of eight,
- study non-blocking cache options by implementing them with the Mentor Graphics CAD tools,
- study a specific aspect of a survey topic (below), and
- even better, talk to me and come up with your own topic.

Some Possible Survey Topics

Describe, compare and contrast (generally broader than the above research topics):

- implications of moving from 32-bit to 64-bit architectures,
- superscalar (VLIW) vs. pipelined,
- effect on architecture of changing technology (e.g., GaAs and fiber optics),
- high-performance I/O (e.g., ISDN or ATM networks),
- the history of some aspect of computer architecture (e.g., stored-programs, caches, virtual memory, pipelining, microcode, protection),
- the evolution of 80x86 (or IBM 360/370/...) architecture and implementation, and
- even better, talk to me and come up with your own topic.