CS 380P Parallel Systems

Lectures:	MW 2:00-3:30
	GAR 1.126
Unique number:	53645
Class Web Page:	http://www.cs.utexas.edu/users/lin/cs380p/

	Instructor	Teaching Assistant	Admin. Assistant
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Office Hours:	MW 3:30-4:30	MTu 10:00-2:00	

Course Objectives. This course has two goals. The first is help students acquire and develop parallel programming skills. The second is to teach students fundamental principles of parallel computing by providing a broad look at the field, touching on topics in computer architecture, programming models, languages, performance evaluation, algorithms, and applications. We will consider both small-scale and large-scale parallelism, and we will consider both traditional (scientific) and modern (e.g., graphics) applications.

Text. *Principles of Parallel Programming.* Lin and Snyder. Addison-Wesley, 2008, ISBN-10: 0321487907, ISBN-13: 9780321487902.

Prerequisites. Good programming skills, preferably in C or C++. Familiarity with computer systems will be useful.

Expectations. The workload will be heavy. There will be fairly regular readings, one midterm, and one of two programming options: (1) approximately nine programming assignments; (2) approximately six programming assignments plus a course project. For option 1, the assignments are worth 60%, the readings 10%, and the midterm 30%. For option 2, the assignments are worth 30% and the project 30%.

Content. We'll roughly cover the following material.

- Motivation
  - The changing role of parallelism
- Basic Principles
  - Sources of inefficiency; metrics: execution time, speedup, etc.; throughput vs. latency; scalability, massive parallelism, Amdahl's Law, Gustafson's Law
- Architectures
  - Trends in architectures, including CMPs, GPUs, and Grids
- Parallel Programming: Low Level Approaches
  - Threads, message passing, TM
- Parallel Programming: Higher Level Approaches
  - ZPL, automatic parallelization and HPF, Chapel, MapReduce
- Parallel Algorithms
  - Models of parallelism: PRAM, CTA

Readings

For each assigned reading, you will submit a written response by 5:00pm on the day before the class meets. You have great freedom in your response, but the point is to encourage you to think critically about what you've read. You might: ask

clarifying questions, ask insightful questions, challenge assumptions, make new connections, contrast or relate the reading to other readings or programming assignments, identify aspects that you'd like to explore more deeply, summarize the main points.

Programming Assignments

Most of the programming assignments will use Pthreads or MPI. A few of the assignments will introduce students to other languages.

Assignment 0: Due January 16

1. Obtain a TACC account: On the TACC User Portal (`https://portal.tacc.utexas.edu`) click on the "Register for a TACC account" link on the left side of the page and follow the directions.
2. Mail your TACC account ID to the TA.

The Project Option

The Project Option allows students to explore in depth some particular area of parallel computing. These projects can be done in teams or individually, and they can take many different forms, possibly involving design, implementation, experimentation, analysis, or evaluation. One broad class of projects is to implement some non-trivial parallel program, but more research-oriented projects are possible as well. *I expect relatively few students to take this option. Basically, you need to convince me that you have a good project idea, after which I will be happy to provide help and guidance at every step of the project.*

Class Communication. We have both a class web page and a Piazza page. The former will contain handouts and announcements; the latter (`piazza.com/utexas/spring2013/cs380p`) allows you to ask questions and hold discussions.

Office Hours/Open Door Policy. My door is usually open when I am in, so please feel free to come to my office whenever my door is open. (If the door is slightly cracked, consider it open.) In the rare case that my door is completely closed, **please do not knock** unless you have an appointment with me.

Administrative Assistant. My administrative assistant is Phyllis Bellon. *See Phyllis when you need to retrieve unclaimed assignments or handouts, or if you wish to see your graded midterm exam.*

Scientific Ethics

Basically, we'll apply the usual standards of the scientific community: collaboration is encouraged but must be cited. Cheating, including plagiarism, will lead to failure of the course. Please read the following brief document to make sure that you understand the definition of plagiarism:

`http://deanofstudents.utexas.edu/sjs/scholdis_plagiarism.php`

Note a few points of emphasis from this document:

- While it's clear that the use of verbatim material without proper attribution constitutes plagiarism, other types of material can be plagiarized as well, such as ideas drawn from an original source or even its structure (e.g., sentence construction or line of argument).
- Minor revisions to borrowed text amounts to plagiarism. So by merely changing a few words or rearranging several words or sentences, you are not paraphrasing; you are plagiarizing.
- Material that is copied or slightly modified is considered to be plagiarized even if the original work is cited as a reference. To avoid plagiarism, you need to both cite the work and make it clear that the text was originally written by others.