CS 4960-01: Parallel Programming

Fall 2008

Instructor: Matthew Flatt

MWF 10:45-11:35
About Parallelism

Course Details
Moore’s Law

Slide from Maurice Herlihy

Transistor count still rising

Clock speed flattening sharply

Clock Speed (MHz)

Transistors (000)

slide from Mary Hall (from Maurice Herlihy)
Some Terminology

- **Concurrency**: logically simultaneous
  - sometimes a good organization (e.g., GUIs)
  - shared state $\implies$ difficult to reason about

- **Parallelism**: physically simultaneous
  - to improve performance
  - implies concurrency

- **Distributed Computing**: multiple machines
  - to improve performance or reliability
  - implies parallelism
Automatic Parallelism

• Process-level Parallelism by OS
  ○ Works well
  ○ Limited benefit for individual applications

• Parallelizing Compilers
  ○ Work only in limited domains

This course is about making things parallel yourself
The “hello world” of parallel programming:

add up an array of numbers
Sequential Sum
Parallel Sum

```
Array elements

76
  /\  /
35 /\  41
/\  /\  /\  
10/\ 25/\ 31/\ 10
 7 3 15 10 13 18 6 4

Time
```
Parallel Prefix Sum
About Parallelism

Course Details
Programming

Expect

- Java
- C
  - Posix Threads
  - OpenMP
  - MPI
- ZPL

*and maybe more*
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<tr>
<th>Day</th>
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<tbody>
<tr>
<td>Monday</td>
<td>Student homework&lt;sub&gt;A&lt;/sub&gt; presentation</td>
<td>Tuesday</td>
<td></td>
<td>Wednesday</td>
<td>Lecture&lt;sub&gt;A&lt;/sub&gt;</td>
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<td>Homework&lt;sub&gt;A&lt;/sub&gt; due</td>
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<td>Lecture&lt;sub&gt;B&lt;/sub&gt;</td>
<td>Thursday</td>
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<td>Homework&lt;sub&gt;B&lt;/sub&gt; assigned</td>
<td>Friday</td>
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Grading

Homework: 40%
Class participation: 10%
Mid-term 1: 15%
Mid-term 2: 15%
Final/project: 20%
Web Page

http://www.eng.utah.edu/~cs4960-01/
Mailing List

cs4960-01@list.eng.utah.edu

Sign up right away!

(see course web page for info)
Office Hours

• By appointment:

  send mail to mflatt@cs.utah.edu

• “Regular” hours:

  TBA