1 First Meeting

- CENG 471 Parallel Computing Fall 2010
- THURSDAY 12:40 - 14:30 (T) INT3
- FRIDAY 12:40 - 14:30 (L) INT3
- Instructor: Cem Özdoğan Computer Engineering Department, A318
- TA: Efe Çiftçi
- WEB page: http://siber.cankaya.edu.tr/
- Announcements: Watch this space for the latest updates.

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September 28, 2010 17:42 THIS WEB PAGE IS FINALLY
AVAILABLE. In the first lecture, there will be first
meeting and introductory studies. The lecture notes for
the second week will be published soon, see Course Schedule
subsubsection.
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- All the example c-files (for lecturing and hands-on sessions) will be accessible via the link.

1.1 Lecture Information

- There is one group for lecturing.
- You will be expected to do significant programming assignments, as well as run programs we supply and analyse the output.
- Since we will program in C on a UNIX environment, some experience using C on UNIX will be important.
- In Hands-on sessions, we will concentrate upon the message-passing method of parallel computing and use the standard parallel computing environment called MPI (Message Passing Interface).
- Thread-based programming will also be outlined, and the distributed shared memory (DSM) approach (If we have enough time).
- Each student will complete a project based on parallel computing for the laboratory study.

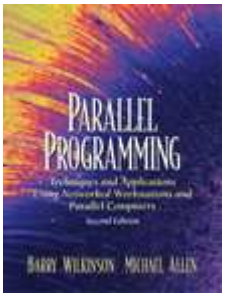
- Also, each student will complete a project based on parallel computing, (distributed computing, cluster computing) for the midterm exam.
- Important announcements will be posted to the Announcements section of the web page, so please check this page frequently.
- You are responsible for all such announcements, as well as announcements made in lecture.

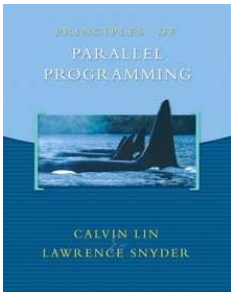
1.2 Overview

- This course provides an introduction to parallel and distributed computing and practical experiences in writing parallel programs on a cluster of computers.
- You will learn about the following topics:
  - Parallel Computers,
  - Message Passing Computing,
  - Embarrassingly Parallel Computations,
  - Partitioning and Divide-and-Conquer Strategies,
  - Pipelined Computations,
  - Synchronous Computations,
  - Load Balancing,
  - Programming with Shared Memory
- Topics might be classified into two main parts as;
  1. Parallel computers: architectural types, shared memory, message passing, interconnection networks, potential for increased speed.
  2. Basic techniques: embarrassingly parallel computations, partitioning and divide and conquer, pipelined computations, synchronous computations, load balancing, shared memory programming.

1.3 Text Book

- Required:
- Recommended: Principles of Parallel Programming, by C. Lin and L. Snyder, Addison-Wesley 2009, ISBN 0-32-148790-7.





- Recommended: Parallel Programming: Techniques and Application Using Networked Workstations and Parallel Computers, 2nd edition, by B. Wilkinson and M. Allen, Prentice Hall Inc., 2005, ISBN 0-13-140563-2.

- Beowulf Cluster Computing with Linux, 2nd edition, edited by William Gropp, Ewing Lusk, Thomas Sterling, MIT Press, 2003, ISBN 0-262-69292-9.

- Beowulf Cluster Computing with Windows, Thomas Sterling , MIT Press, 2001, ISBN 0-262-69275-9.

- Using MPI , Portable Parallel Programming with the Message Passing Interface, William Gropp, Ewing Lusk and Anthony Skjellum, The MIT Press, 1999, ISBN 0-262-57132-3.

- Using MPI-2, Advanced Features of the Message Passing Interface, William Gropp, Ewing Lusk, Rajeev Thakur, The MIT Press, 1999, ISBN 0-262-57133-1.

- MPI: The Complete Reference (Vol. 1) - The MPI Core, Marc Snir, Steve Otto, Steven Huss-Lederman, David Walker and Jack Dongarra, The MIT Press, 1998, ISBN 0-262-69215-5.

- MPI: The Complete Reference (Vol. 2) - The MPI-2 Extensions, William Gropp, Steven Huss-Lederman, Andrew Lumsdaine, Ewing Lusk, Bill Nitzberg, William Saphir and Marc Snir, The MIT Press, 1998, ISBN 0-262-57123-4.

- In Search of Clusters: The ongoing battle in lowly parallel computing, Second Edition, by Gregory F. Pfister, Prentice Hall Publishing Company, 1998, ISBN: 0-13-899709-8.

- How to Build a Beowulf - A Guide to the Implementation and Application of PC Clusters, by Thomas Sterling, John Salmon, Donald J. Becker and Daniel F. Savarese, MIT Press, 1999, ISBN 0-262-69218-X.
- PVM: Parallel Virtual Machine, A Users' Guide and Tutorial for Network Parallel Computing, Al Geist, Adam Beguelin, Jack Dongarra, Weicheng Jiang, Robert Manchek and Vaidyalingam S. Sunderam, MIT Press, 1994, ISBN 0-262-57108-0.

1.4 Grading Criteria & Policies

- There will be a final exam: 40%
- Term Project as Midterm exam: 25%
- Term Project as Lab. exam: 25%
- Attendance is REQUIRED and constitutes part of your course grade; 10%. You are responsible for everything said in class.
- I encourage you to ask questions in class. You are supposed to ask questions. Don't guess, ask a question!
- The code you submit must be written completely by you. You can use anything from the textbook/notes.

1.5 Parallel Computing

- Data-intensive applications; transaction processing, information retrieval, data mining and analysis, multimedia services, computational physics/ chemistry/biology and nanotechnology.
- High performance may come from
  - fast dense circuitry,
  - packaging technology,
  - parallelism.
- Parallel processors are computer systems consisting of multiple *processing units* connected via some *interconnection network* plus the software needed to make the processing units work together.
- *Uniprocessor* – Single processor supercomputers have achieved great speeds and have been pushing hardware technology to the physical

- *Uniprocessor* – Single processor supercomputers have achieved great speeds and have been pushing hardware technology to the physical limit of chip manufacturing.
  - Physical and architectural bounds (Lithography, μm size, destructive quantum effects.
  - Proposed solutions are maskless lithography process and nanoimprint lithography for the semiconductor).
  - Uniprocessor systems can achieve to a limited computational power and not capable of delivering solutions to some problems in reasonable time.