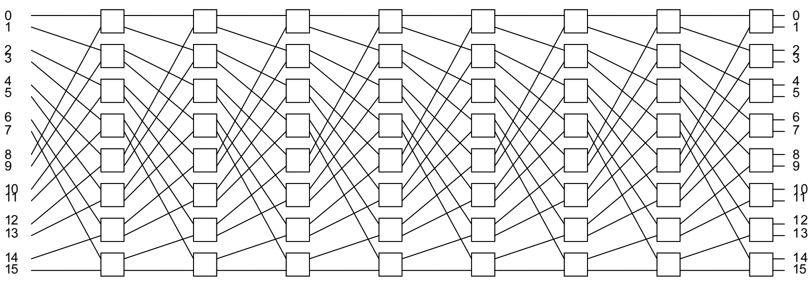
 01-1

EE 7725—Interconnection Networks

Interconnection Network:

Hardware used to connect the processors in a parallel computer.



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Course Organization and Policies

Grading and Assignments

- 30%, Midterm Exam
- 30%, Final Exam (Cumulative)
- 20%, Term Project
- 20%, Homework Assignments (Approximately 6)

Term Paper

Answer the question given in the project handout.

Term project will help develop skills needed for Master's and Ph.D. work.

- Reading and understanding journal papers.
- Discover new facts using published information and your own analysis.

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Course Organization and Policies

Web Page

`http://www.ee.lsu.edu/koppel/ee7725`

Text

No text required.

Papers and handouts will be made available.

Office Hours

Monday and Thursday, 14:00–16:30, 349 EE Building.

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Prerequisites

Knowledge of computer architecture:

- Difference between bus and multiplexor.
- How memory is accessed.
- How cache and main memory are organized.

Basics of discrete mathematics:

- Set operations.
- How to specify members of a set.

Inductive proof.

Probability theory.

Parts of Parallel Computer

- *Processing Elements (PEs)*

  Name for CPU in a parallel computer.

- *Parallel Program*

  Program which runs on the PEs.

  Parallel program divided into *tasks*.

  Each task runs on one PE.

  A PE can run any number of tasks.

  SIMD Parallel Computer: PEs simultaneously execute the same instruction. (Nearly obsolete.)

  MIMD Parallel Computer: Each PE executes instructions on its own.

- *Interconnection Network*

  Used to connect the processors.

Course Topics

Importance of Networks in Parallel Processing

Performance Measures

System Performance Model

Types of Networks

Direct Networks

Measures

Deadlock, livelock.

k-ary n-cube family.

de-Bruijn family.

Other networks.

Parallel Computer

Motivation: *Serial* computers not fast enough.

A serial computer uses a single CPU.

Idea:

- Use more than one CPU.
- Divide problem into parts.
- Run each part on a CPU.

Hard Part of Parallel Processing

Parallel Algorithms

Always having useful work for all the processors.

Communication

Having data where it's needed, when it's needed.

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Course Topics

Omega Networks

Congestion Reduction /Fault Tolerance

Network Equivalence and Transformation

Omega Network Admissible Permutations

Clos and Beneš Permutation Networks

Generalized Connectors

Sorting Networks

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