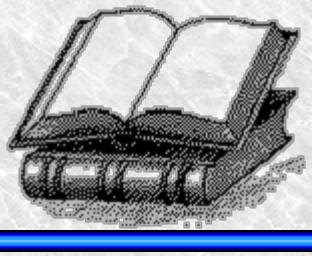

COMPUTER ARCHITECTURE TUTORIAL

By Gurpur M. Prabhu

Read Prabhu's new book Anita's Legacy

This tutorial is intended as a supplementary learning tool for students of Com S 321, an undergraduate course on computer architecture taught at Iowa State University. The text book for the course is "Computer Organization and Design: The Hardware/Software Interface" by Hennessy and Patterson. The concepts explained include some aspects of computer performance, cache design, and pipelining. Examples, interactive applets, and some problems with solutions are used to illustrate basic ideas. Most of the material has been developed from the text book as well as from "Computer Architecture: A Quantitative Approach" by the same authors. The problems that have been solved have been taken from a number of sources, but the solutions are unique in the sense that emphasis has been placed not only on the answers but also on the reasoning processes that will help students solve similar problems.

To be able to see and interact with java applets in this tutorial, please enable Java in your browser. If you work with Netscape browser, go to Edit/Preferences/Advanced and check the box "Enable Java".

Feedback consisting of comments and errors are welcome, and can be e-mailed

to Gurpur Prabhu at prabhu@cs.iastate.edu.

Topics

Computer Performance

- Amdahl's Law
- Computer Performance - I
- Computer Performance - II

Memory Hierarchy Design

- Principles and Levels
  - Make the Common Case Fast
    - Amdahl's Law
  - Principle of Locality
  - Smaller is Faster
- Common Questions
  - Block Placement
    - Placement Methods
    - Examples
  - Block Identification
    - Address Structure
    - Examples
  - Block Replacement
    - Policies
    - Interactive applet to check different policies
    - Example (a problem)
  - Interaction with Memory
    - On Read
    - On Write
    - Interactive Diagram
    - Example (a problem)

Pipelining

- Classification of Instruction Sets
- Addressing Modes
  - Memory Interpretation
  - Memory Alignment
- DLX architecture
  - Instruction Set
  - Instruction Layout
  - Examples of Instructions
  - An Implementation of DLX
  - The Basic Pipeline for DLX