

John Mason, 4E13 ←

John

This appears to be a good in-depth look at hypercube issues related to our problem. How about sending a SW and analyst type to this in January if followup calls by Brent (Curtis) show that enough relevant issues will be covered?
Tom

■ Hypercube Computers: Concurrent Programming, Algorithms, and Applications

JANUARY 18-20 ←

O V E R V I E W

This course provides an overview of the hypercube concurrent processing architecture and introduces fundamental concepts and techniques for programming these computer systems. Synchronous and asynchronous communication models for hypercubes are discussed. The design of a software development environment that provides data sharability among multiple applications programs, supports automatic data distribution, and minimizes data traffic is presented. Several applications are examined as types of problems for which these computers are appropriate.

A concurrent version of the Spectral Analysis Manager (SPAM), a comprehensive program for the analysis of multispectral data, is described. Problem decomposition techniques and load balancing issues are discussed in detail for matrix manipulation, finite difference, finite element, and FFT methods. The design, implementation, and evaluation of parallel relational database support (selection, projection, and join) on the hypercube is demonstrated. Particular attention is given to dynamic parallel algorithm selection based on query and relation sizes, synchronous vs. asynchronous data transfer, concurrent I/O requirements, and performance evaluation. A new approach to creating concurrent simulations that provide continuous process simulation of heterogeneous elements is presented; this capability allows loosely coupled sets of tightly coupled multiprocessors to interact in real-time. An SDI simulation created for the Air Force exemplifies this simulation structure. The distributed discrete event simulation operating system, Time Warp, is also analyzed.

COURSE MATERIALS

Solving Problems on Concurrent Processors, Vol. 1: General Techniques and Regular Problems, G. C. Fox, M. A. Johnson, G. A. Lyzenga, S. W. Otto, J. K. Salmon, and D. W. Walker (Prentice-Hall 1988), plus lecture notes, are to be distributed on the first day of the course. These notes are available to course participants only, and are not for sale.

COORDINATOR AND LECTURER

Kay Cloud, BS

ESD Hypercube Applications Coordinator, Hypercube Project Office, Jet Propulsion Laboratory, Pasadena, California. Ms. Cloud has been at JPL for four years, developing operating system, user-interface, and applications software for the hypercube concurrent processor. For the last year-and-a-half she has been the coordinator for a major data-driven concurrent simulation involving several non-homogeneous components that simultaneously compute and interact.

LECTURERS

Meemong Lee, PhD

Technical Group Leader, Jet Propulsion Laboratory, Pasadena, California. Dr. Lee's current activities include development of a concurrent image processing executive for a scientific data analysis workstation, design of a concurrent HIRIS ground data processing testbed using parallel computer architectures, and implementation of a concurrent spectral analysis manager on a hypercube. She served as a principal investigator on MPRIA (Mathematical Pattern Recognition and Image Analysis) research for NASA, and worked as a senior project engineer at Intel Corporation. She has authored or coauthored 15 papers.

Roger Lee, PhD

Supervisor, Concurrent Processors Systems, Integration Group, Jet Propulsion Laboratory, Pasadena, California. Dr. Lee is currently involved in the design and implementation of operating systems for the next-generation JPL hypercube. He has designed and implemented the Mercury and Centaur operating systems for the CalTech/JPL Mark III hypercube, and supervised development of operating system utilities. His research interests include distributed operating systems and parallel languages.

Gregory Lyzenga, PhD

Technical Group Leader, Jet Propulsion Laboratory, Pasadena, California. Dr. Lyzenga has eight years' research experience in numerical modeling of continuum and structural systems for geophysical applications, including high pressure equations of state as applied to geophysics application of parallel processing to scientific simulation and modellings and characterization of asteroids by occultation and photometric methods. He has also researched and developed finite element methods for hypercube concurrent processor computers. He is coauthor of a textbook on concurrent programming methods, and has authored or coauthored 19 papers. Dr. Lyzenga is a member of the American Geophysical Union and AAAS.

Jean Patterson, AB

Technical Group Leader, Jet Propulsion Laboratory, Pasadena, California. Ms. Patterson has worked for four years in the area of parallel algorithm development. She has been involved in concurrent programming for such applications as parameter estimation and radiative transfer. She has also organized and participated in several JPL/Caltech videotape courses which present parallel algorithms and decomposition techniques. She is currently the task manager for a JPL effort to develop interactive electromagnetic scattering analysis capabilities for large-scale problems utilizing the Mark III hypercube parallel environment.

Edwin T. Upchurch, PhD

Associate Professor, Computer Science Department, U.S. Naval Academy, Annapolis, Maryland. Aside from his teaching responsibilities, Dr. Upchurch conducts research into database machine design, reconfigurable parallel machine architectures, modeling and performance engineering of complex hardware/software systems, and the development of intelligent computer tools for performance engineering. He has served as principal investigator on several research projects, has co-authored a book on the performance engineering of computer information systems, and authored or coauthored over 25 publications.

UCLA FACULTY REPRESENTATIVE

David R. Jefferson, PhD

Assistant Professor, Computer Science Department, School of Engineering and Applied Science

DAILY SCHEDULE

■ WEDNESDAY *Morning*

Hardware and Programming Environment (R. Lee)

- Overview; what is a hypercube concurrent processor?
- Hardware issues
 - Comparison of hypercube architectures
- Hypercube operating systems
 - Communication protocols
 - Programming utilities
 - Programming models
- Fault tolerance concepts
 - Hardware
 - Software

WEDNESDAY *Afternoon*

Hardware and Programming Environment (cont'd) (M. Lee)

- An image processing operating system
- Using an image processing operating system
 - Multispectral data analysis techniques
 - Image processing and analysis algorithms: image enhancement, restoration, and rectification
 - Image information extraction

■ THURSDAY *Morning*

Numerical Methods (Patterson)

- Introduction to numerical methods
- Matrix algorithms
 - Matrix multiplication
 - Inversion techniques
 - Performance issues
 - Applications: electromagnetics; parameter estimation, e.g., orbit determination

THURSDAY *Afternoon*

Numerical Methods (cont'd) (Lyzenga)

- Finite difference methods
 - Iterative solution methods
 - Domain decomposition
 - Parallel updating
 - Performance issues
 - Applications
- Finite element methods
 - Direct and iterative solution methods
 - Finite element decomposition
 - Communication tasks and program structure
 - Performance and practical application
 - Applications: solid mechanics

- Fast Fourier transform methods
 - FFT parallel decomposition
 - Parallel communication structure
 - Efficiency
 - Applications and generalizations

■ FRIDAY Morning

Applications and Simulations (Upchurch)

- Overview
 - High performance data base support
 - Issues/performance problems
 - Relational data base approach
- Relational data base operations:
 - Data base decomposition
 - Selection of algorithms
- Performance issues
 - I/O bottlenecks
 - The join performance problem
 - Synchronous and asynchronous communications
- A hypercube approach
 - Performance issues
 - Design trade-offs
 - Sub-cube configuration
 - Sorting
 - Data communications
- Applications: an SDI target/missile study
- Performance evaluation

FRIDAY Afternoon

Applications and Simulations (cont'd) (Cloud)

- Simulation techniques
 - Heterogeneous simulations—a real-time SDI simulation for the Air Force, including mapping battle management functions to subcubes, tracking, and weapon-target pairing; continuous process simulation of heterogeneous elements; emulating components of the defense system; emulating components of the offensive system; emulating the interactions of platforms, weapons, and threats; supporting graphics displays
 - Discrete event simulations using Time Warp
- Issues and Summary

For *technical* information about the course, call Kay Cloud at (818) 354-2238.

For *registration* information, call the Short Course Program Office at (213) 825-3344.

Date: **January 18-20** (Wednesday through Friday)

Time: 8 am-5 pm

Location: Room 211, UCLA Extension Building, 10995 Le Conte Avenue (adjacent to the UCLA campus), Los Angeles, California

EDP N5376W Course No. Engineering 819.181
1.8 CEU

Fee: \$995, includes course materials

Note: A \$50 charge will be added to the course fee for enrolling at the door without preenrollment or a telephone reservation.

General Information

Prerequisite

BS in engineering or science, or equivalent experience in or relating to the course topic, unless otherwise stated.

Enrollment

Fee for the course includes lecture notes. It *does not* include parking, lodging, or meals unless otherwise specified. Enrollment is limited.

Early enrollment is recommended. Participants may enroll by mail using the application form provided on the back panel of this brochure. Return the entire panel, whether original or photocopy. Do not remove or cover the mailing label or imprinted code.

A tentative reservation may be made by calling the Short Course Program Office at (213) 825-3344. This reservation may be canceled at any time without penalty.

Late and/or on-site enrollments are also permitted if space allows; however, a \$50 charge will be added to the course fee for enrolling at the door without having made a prior reservation or payment arrangement.

Details regarding course location, parking, and housing accommodations will be mailed to everyone who enrolls or reserves a place in a short course. For additional information, contact UCLA Extension, Short Course Program Office, 10995 Le Conte Avenue, Room 639, Los Angeles, CA 90024-2883.

UCLA Extension reserves the right to cancel or reschedule a short course, and to change instructors (full refund if course is canceled, discontinued, or rescheduled).

Refunds

The course fee (less a \$50 service charge) will be refunded *only* if cancellation of enrollment is received prior to the first day of the course. The Short Course Program Office should be notified immediately by telephone (see number under "Enrollment") followed by a written request for refund.

Academic Discounts

A limited number of 40% discounts on short course fees are available to full-time faculty members and full-time graduate students from accredited universities. A written request for this reduced fee should be submitted to the Short Course Program Office (see address under "Enrollment") at least three weeks prior to the course. Verification of full-time status at an accredited university must accompany the request.

Continuing Education Unit (CEU)

One CEU is awarded for each 10 contact hours of satisfactory participation in an organized noncredit continuing education program.

Mailing List

To add your name to the engineering short course mailing list, contact Department of Engineering, UCLA Extension, 10995 Le Conte Avenue, Room 639, Los Angeles, CA 90024-2883; (213) 825-1047.

In accordance with applicable Federal laws and University policy, the University of California does not discriminate in any of its policies, procedures, or practices on the basis of race, color, national origin, sex, sexual orientation, age, or handicap. Inquiries regarding the University's equal opportunity policies may be directed to Campus Counsel, 2241 Murphy Hall, UCLA, or the Director of the Office for Civil Rights, Department of Education. Please call (213) 825-7851 for information on special services for handicapped students (voice or TDD).



10995 Le Conte Avenue, Los Angeles, CA 90024-2883

THREE ENGINEERING SHORT COURSES

Fall 1988/Winter 1989
in Los Angeles, California

Mail Application for Enrollment (Please Print) **Fall 1988/Winter 1989**

Please fill in correct EDP number

EDP No.	Course Title and Number	Fee

*Social Security Number Please check box if new address

Name (First/Middle/Last) Male Female *Birthdate (Mo/Day/Yr)

Home Address ()

City/State/ZIP Area Code/Daytime Phone

Position or Title

Company

Business Address

City/State/ZIP

- Purchase Order
- Authorization to Bill Company
- Check enclosed payable to: The Regents of the University of California

Charge: _____

- MasterCard
- VISA

9 _____ Mo/Yr _____
Authorizing Signature Expiration Date

Mail to: P.O. Box 24901, Dept. K, UCLA Extension, Los Angeles, CA 90024-0901

Please Return This Entire Panel.
Do Not Remove or Cover
Mailing Label or Imprinted Code.

Nonprofit Org.
U.S. Postage
PAID
UCLA Extension

THOMAS J PALM
9518 28TH AVE NW
SEATTLE

PL518
WA 98117

*By Regental authority,
your Social Security
number is requested
in order to verify your
identity for accurate
record keeping. Your
providing the number
and your birthdate
is voluntary.



Mailroom: Please reroute to replacement, Training Director, or VP of Engineering.

NOT PRINTED AT STATE EXPENSE / 4678-88