

Parallel Algorithms - Video course

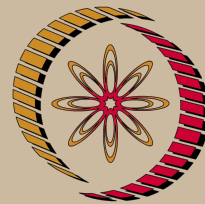
COURSE OUTLINE

Parallel computing has become mainstream and very affordable today. This is mainly because hardware costs have come down rapidly. Processing voluminous datasets is highly computation intensive. Parallel computing has been fruitfully employed in numerous application domains to process large datasets and handle other time-consuming operations of interest.

As a result, unprecedented advances have been made in such areas as biology, scientific computing, modeling and simulations, and so forth. Hence the objective of this course is to introduce parallel algorithms and compare it with its sequential equivalent. The MPI implementation of some algorithms will also be discussed.

COURSE DETAIL

Module	Topic	Hours	Total hours per module
I (Introduction)	<ul style="list-style-type: none"> • Need for parallel computers • Models of computation • Analyzing parallel algorithms • Expressing parallel algorithms 	1/2 hour 1/2 hour 1/2 hour 1/2 hour	2
II (Dense Matrix algorithms)	<ul style="list-style-type: none"> • Matrix vector Multiplication • Matrix matrix multiplication 	1 1	2
III (Decomposition & Mapping techniques)	<ul style="list-style-type: none"> • Database query processing • 15 puzzle problem • Parallel discrete event simulation • Image dithering • Dense LU factorization 	1 1 1 1 1	5
IV (Sorting)	<ul style="list-style-type: none"> • Hyper quick sort • Merge sort • Bitonic merge sort • odd even transposition • Enumeration sort (sorting on the CRCW model, CREW model and EREW model) 	2 2 2 2 2	10
V (Searching and selection)	<ul style="list-style-type: none"> • Searching on a sorted sequence 	4	11



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Computer Science and Engineering

Pre-requisites:

1. Data Structures
2. Design and Analysis of algorithms

Additional Reading:

- Nil

Hyperlinks:

- Nil

Coordinators:

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	(EREW,CREW,CRCW) <ul style="list-style-type: none"> • Searching on a random sequence (EREW, CREW, CRCW, Tree and Mesh) • Sequential selection algorithm • Parallel selection algorithm (EREW parallel solution) 	4 1 2	
VI (Graph algorithms)	<ul style="list-style-type: none"> • Graph coloring • Minimal spanning tree • Shortest path algorithm 	4 3 3	10

References:

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar "Introduction to Parallel Computing", Second Edition, Addison Wesley, 2003. ISBN: 0-201-64865.
2. S.G.Akl, "The Design and Analysis of Parallel Algorithms", PHI, 1989.
3. F.T.Leighton, "Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes", MK Publishers, San Mateo California, 1992.
4. Wilkinson, M.Allen,"Parallel Programming Techniques and Applications using networked workstations and parallel computers", Prentice Hall, 1999.
5. Michael J. Quinn, "Parallel computer theory and practice", McGraw Hill, Second Edition, 1994.