

Parallel Sorting Algorithms

- **Comparison Sorts**

if ($A > B$)

{ temp=A; A=B; B=temp; }

- **Potential Speed-up**

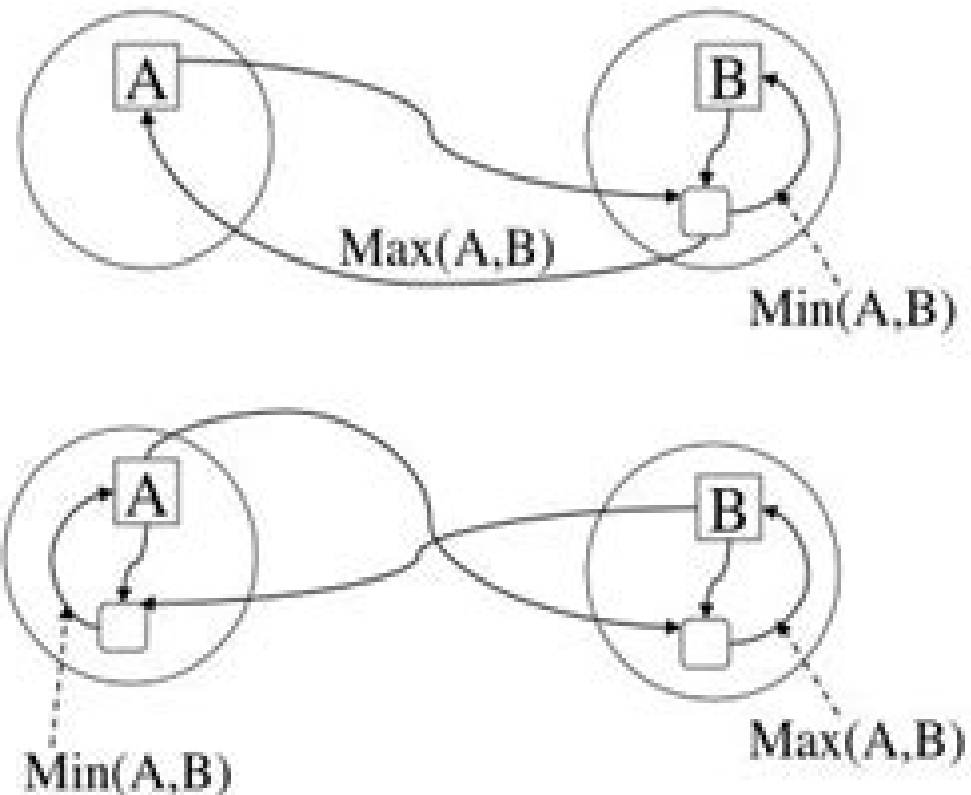
- Optimal Comparison Sort: $O(N \lg N)$
- Optimal Parallel speed-up $O(\lg N)$ if $P=N$
- Huge Big Oh constant

- **Source of problems**

- Duplicate computations to reduce message passing
- Different precision at different processors

- **Key**

- Processors independently working on data sections



Parallel Sorting Algorithms

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Menon**

Parallel Sorting Algorithms:

Parallel Sorting Algorithms Selim G. Akl, 2014-06-20 *Parallel Sorting Algorithms* explains how to use parallel algorithms to sort a sequence of items on a variety of parallel computers. The book reviews the sorting problem, the parallel models of computation, parallel algorithms, and the lower bounds on the parallel sorting problems. The text also presents twenty different algorithms such as linear arrays, mesh connected computers, cube connected computers. Another example where an algorithm can be applied is on the shared memory SIMD (single instruction stream, multiple data stream) computers in which the whole sequence to be sorted can fit in the respective primary memories of the computers, random access memory, or in a single shared memory. SIMD processors communicate through an interconnection network or the processors communicate through a common and shared memory. The text also investigates the case of external sorting in which the sequence to be sorted is bigger than the available primary memory. In this case, the algorithms used in external sorting are very similar to those used to describe internal sorting, that is, when the sequence can fit in the primary memory. The book explains that an algorithm can reach its optimum possible operating time for sorting when it is running on a particular set of architecture depending on a constant multiplicative factor. The text is suitable for computer engineers and scientists interested in parallel algorithms.

Parallel Sorting Algorithms Selim G. Akl, 1985 *Parallel Sorting Algorithms* Catherine Jane Scherp, 1990 ***Parallel Sorting Algorithms*** Mary Elizabeth Hribar, 1991 *An Analysis of Parallel Sorting Algorithms and Techniques* Kelly Dean Crawford, 1986 *Implementing Parallel Sorting Algorithms* Jamal Elabed, 1989 ***An Implementation of Parallel Sorting Algorithms*** Cheng-tze Steve Chang, 1988 *Sorting Algorithms and Techniques* Richard Johnson, 2025-06-25

Sorting Algorithms and Techniques presents a comprehensive rigorous journey through the foundational and cutting edge principles of sorting in computer science. Beginning with mathematical preliminaries and theoretical limits, the book explores the essential models and constraints that govern the design of sorting algorithms, delving into formal problem definitions, lower bounds, stability, adaptivity, and the impact of randomization. This solid theoretical grounding is seamlessly connected to a wide survey of sorting strategies, from elementary algorithms such as bubble selection and insertion sorts to sophisticated comparison based methods like merge sort, quicksort, and introsort, as well as practical hybrid approaches used in today's leading libraries. Extending far beyond the basics, the text dives into non-comparison based algorithms such as counting, bucket, and radix sorts, illuminating their strengths, limitations, and suitability for specialized data types and distributions. Special emphasis is placed on large scale and high performance scenarios with dedicated chapters addressing external, parallel, and distributed sorting, including contemporary techniques for massive data sets and frameworks like MapReduce and Spark. Further, specialized sorting challenges such as string and compound key sorting, cache optimized algorithms, sorting for real time and memory constrained environments, and techniques for sparse structured data are examined in depth, equipping the reader to navigate

a broad range of practical and domain specific requirements Recognizing the complexity of modern hardware and software ecosystems the book addresses algorithm engineering common implementation pitfalls profiling and formal verification strategies It concludes with forward looking discussions of privacy preserving sorting hardware acceleration quantum algorithms and current research frontiers Exhaustive yet accessible **Sorting Algorithms and Techniques** is an indispensable reference for computer scientists software engineers and researchers seeking both mastery of established methodologies and insight into the evolving landscape of sorting technology

A Taxonomy of Parallel Sorting Algorithms University of Wisconsin--Madison. Computer Sciences Department, David J. De Witt, D. B. Friedland, D. K. Hsiao, J. Menon, 1982

Parallel Sorting Algorithms Shian-Shyong Tseng, 1984 *A Study of Sequential and Parallel Sorting Algorithms* Massoumeh Karimi, 1979 *Parallel Sorting Algorithms on a Mesh-connected Computer* Chung-horng Lung, 1988 Parallel Sorting Algorithms for Hypercube Multiprocessors Bülent Abali, 1989

A Survey of Parallel Sorting Algorithms David J. De Witt, Dina Friedland, David K. Hsiao, M. Jaishankar Menon, OHIO STATE UNIV COLUMBUS COMPUTER AND INFORMATION SCIENCE RESEARCH CENTER., 1981 A rather comprehensive survey of parallel sorting algorithms is included herein Parallel sorting algorithms are considered in two major categories the internal parallel sorting algorithms and the external parallel sorting algorithms Because external sorting algorithms are important to the database applications considerable emphases are made in the motivation and analysis of the external parallel sorting algorithms surveyed in the report In particular the authors of this report have conducted research in external parallel sorting algorithms and made some important contributions Their findings are also reported herein Author

Parallel Sorting Algorithms on Grid Structures Seng Chuan Tay, 1993 The Design and Analysis of Parallel Algorithms Selim G. Akl, 1989 Mathematics of Computing Parallelism

Parallel Sorting Algorithms on a Hypercube Multiprocessor Daw Yang Shyong, 1988

Parallel Sorting Algorithms for Hypercube Networks Scott McFarland, 1989 *Design, Analysis, and Implementation of Parallel External Sorting Algorithms* Dina Bitton Friedland, 1981

VLSI Implementation of Parallel Sorting Algorithms Bijan Tehrani, 1987

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