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A Balanced Bin Sort for Hypercube Multicomputers*

YOUNGJU WON† and SARTAJ SAHNI
University of Minnesota

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Abstract. We propose a balanced bin sort for hypercube multicomputers. This sorting algorithm has an empirically measured expected run time that is greater than that of hyperquicksort but less than that of bitonic sort. Also, its space requirements are less than that of hyperquicksort but more than that of bitonic sort. So, it is useful in situations in which there is some excess memory but not enough to run hyperquicksort.

1. Introduction

Sorting is a fundamental operation that arises in many applications. While several researchers have studied sorting on hypothetical parallel computers, only a limited amount of work has been published on commercially available parallel computers. Most of the work using theoretical models has been for synchronous SIMD parallel computers. Further, this work has generally assumed the internode communication cost to be comparable to that of a basic arithmetic operation and has also assumed the availability of as many computation nodes as can be gainfully used. In particular, the number of nodes required by most of the proposed sorting algorithms for theoretical models increases as the number of elements to be sorted increases. Commercially available parallel computers, on the other hand, tend to be asynchronous MIMD computers; have a limited number of nodes; and have an internode communication cost that is significantly higher than that of a basic arithmetic operation.

Lakshmivarahan et al. [1984] reviews the sorting literature as it relates to abstract models of parallel computation. Cole [1987] develops an O(log n) merge sort algorithm to sort n elements on an n PE (processing element) computer. Felten et al. [1986], Seidel and Ziegler [1987], Seidel and George [1987], and Wagar [1987] consider sorting on existing hypercube computers.

Seidel and Ziegler [1987] assume that node 0 of the hypercube contains the data to be sorted initially and that the sorted data resides in this node at the end. They present two bitonic sort algorithms and one quicksort algorithm. The two bitonic sort

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† Dr Youngju Won's current address is P.O. Box 77, Gongneung-Dong Nowo-Gu, Seuol, Korea 139–799.