Allocation and Mapping Based Reliability Analysis of Multistage Interconnection Networks

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Abstract

Task allocation using cubic partitioning of multistage interconnection networks (MIN's) offers several advantages over random allocation of resources. The objective of this paper is to analyze MIN reliability considering the cubic allocation algorithm. A comprehensive analytical model is derived for predicting reliability of MIN-based systems where tasks are allocated using the buddy strategy. System reliability with the free list allocation policy is computed via simulation. It is shown that the system reliability is dependent on the allocation algorithm and the free list policy is superior to the buddy scheme in this respect. Two types of mapping algorithms known as conventional and bit reversal are used on a baseline MIN to show that the same allocation algorithm can result in different reliability and performance. A performance-related reliability measure is analyzed using probability of acceptance as the performance measure to demonstrate the trade-offs between performance and reliability.

Index Terms:

Allocation-based reliability

Cubic allocation schemes

Mapping algorithms

Multistage interconnection network

Performance-related reliability

Reliability