URN etd-0407109-183720-1679
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Statistics This thesis had been viewed 42 times. Download 0 times.
Department
Year 2004
Semester 2
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title Fault Tolerance Measures in Folded Hypercubes Based on Forbidden Faulty Sets
Date of Defense 0000-00-00
Page Count 35

Keyword
forbidden faulty sets
interconnection network
folded hypercube
connectivity

Abstract
One crucial step on designing a large-scale multiprocessor system is to determine the topology of the interconnection network. In recent years, many interconnection network architectures have been proposed in the literature. Among them, the hypercube has received much attention due to its high degree of regularity and recursive structure. The hypercube has been used as the interconnection network in a wide variety of commercial and experimental distributed memory multiprocessors such as the Intel iSPC, iSPC/2, the NCUBE family, the Cosmic Cube, and the Connection Machines (CM-1, CM-2). Besides, variations of the hypercube topology have been discovered which further improve some of its properties. The folded hypercube is one of the variations of the hypercube topology and it offers improved performance, such as lower diameter and lower average internode distance.
Since node faults and link faults may happen when a network is put in use, it is practically meaningful to consider faulty networks. A commonly used measure for the fault-tolerance of a network is the minimum number of nodes whose removal can result in disconnecting the network. This measure has been referred to as connectivity. However, the measure of connectivity cannot necessarily represent the fault-tolerant capability of an interconnection network. For the n-dimensional hypercube, the connectivity is equal to the degree of the network, which is n. The n-dimensional hypercube may become disconnected when all n neighbors of a processor fail. Nevertheless, the likelihood of having a disconnected hypercube due to n faulty processors is negligible and indeed asymptotically zero. Therefore, the sole notion of connectivity does not fairly reflect the resilience of the network. Motivated by this observation, Esfahanian introduced the concept of forbidden faulty sets. The components of any forbidden set cannot be faulty at the same time. In this paper, we will find the connectivity for the folded hypercube based on the concept of forbidden faulty sets. The results will practically reflect the resilience of the network.
Advisory Committee Hui-Ling Huang - advisor

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Date of Submission 2005-07-23