Electrical & Computer Engineering

S E M I N A R

Louisiana State University

Bounds on the Loading of Multiple Bus Networks for k-ary Tree Algorithms

H. P. Dharmasena

Department of Electrical and Computer Engineering

Louisiana State University

Abstract—A Multiple Bus Network (MBN) connects a set of processors via a set of buses. This mode of connecting processors can be viewed as a generalization of point-to-point topologies, and has many advantages over single bus systems. Two important parameters in an MBN are *degree* and *loading*. Degree is the largest number of connections to a processor and loading is the largest number of processors connected to a bus. These parameters are important because they determine cost and implementability. The degree corresponds to the number of input/output ports per processor, and it is desirable to keep it as small as possible. The loading limits the rate at which data can be transmitted on the bus.

This presentation addresses the relationship between the running time, degree, and loading of MBNs that run k-ary tree algorithms (binary tree algorithms are a special case of k-ary tree algorithms with $k = 2$). These algorithms are fundamental, and have a large number of applications. Specifically it is shown that constant loading is not possible in optimal-time k-ary Tree MBNs. An $\Omega(n/(k \log n/k))$ lower bound on the loading for running a k^n-input problem optimally is presented. It is also shown that if the degree is increased to $k + 1$ or the algorithm is run sub-optimally then it is possible to achieve constant loading and that present MBNs that match these bounds.

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