Embedding Parameters in Interconnection Networks

Abstract

In Applied Mathematics and Theoretical Computer Science, combinatorial optimization is a topic that consists of finding an optimal object from a finite set of objects. Graph Partitioning is a fundamental technique in graph theory. Cutting a graph into smaller pieces is one of the basic algorithmic operations. Partitioning large graphs is often important for complexity reduction or parallelization. In practice, one often seeks to find a partition that minimizes (or maximizes) an objective. Graph partitioning technique is used widely to solve several combinatorial problems. The problem of simulating one network by another is modeled as a *graph embedding problem.* If a network A can be embedded in a network B, then all the algorithms developed for parallel processing with network A can be easily transported onto another processor network B. However graph embedding includes some combinatorial problems such as bandwidth problem, cutwidth problem, treewidth problem, wirelength problem, forwarding index problem, vertex ordering and topology mismatch. The quality of an embedding can be measured by certain cost criteria, namely dilation, congestion and wirelength. While the general problem of graph embedding is difficult, by exploiting the special structure of the interconnection schemes, a number of results relating to optimal embedding of one class of networks into another have been developed. In this talk, new theoretical results and techniques are explored and applied to find congestion and wirelength of different networks.