Data distribution equivalence for data intensive interconnection networks.

This thesis considers two problems.  One problem is closed-form solutions for equivalence computation of divisible workload in a mesh and toroidal networks and the other problem is scheduling divisible workloads from multiple sources in mesh and toroidal networks of processors.

We propose a flow matrix closed-form equation to present the equivalence, which allows a characterization of the nature of minimal time solution and a simple method to determine when and how much load to distribute for processors.

Also, we propose the use of a reduced Voronoi diagram algorithm (RVDA) to minimize the overall processing time of these workloads by taking advantage of the processor equivalence technique.

Three case studies with 10 sources of workloads are presented to illustrate the general approach for multiple sources of workloads.

In the first phase, a Voronoi Manhattan distance diagram is used to obtain a network cluster division.

In the second phase, we propose an efficient algorithm to obtain near-optimal load distribution among processors represented by equivalent processors. The algorithm minimizes the number of processors utilized.

In the third phase, we propose an algorithm to accelerating the bottleneck Voronoi cell’s computation.

Experimental evaluation through simulations demonstrates that a task can be finished in the same suboptimal time and yet save about 40% of processor resources. Also, it can improve about 10%-20% speedup.