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A MULTILEVEL GRAPHICAL APPROACH TO TASK PARTITIONING IN PARALLEL AND DISTRIBUTED SYSTEM

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ABSTRACT

A multiprocessor system can be easily represented as large graph. High quality partitioning for graph are used in a wide range of application domain. Parallel and Distributed system compose task partitioning strategy in a true multiprocessing manner. Graph partitioning is an important problem that has extensive application in many areas, including scientific computing, VLSI design, matrix multiplication and task scheduling. The main aim of graph partitioning is to partition the vertices of a graph in such a way that the number of edges connecting vertices in different parts is minimized. Partitioning a big graph is an important task to reduce complexity or for parallelization. Multilevel graph partitioning scheme is very efficient to implement and produces good result. The basic structure of multilevel graph partitioning includes coarsening of large graph, partitioning of coarsen graph then uncoarsening and refinement of the partitioned graph. Since the finer graph has more degree of freedom, such refinement usually decreases the edge-cut. Relative to other advance methods the multilevel algorithm produces high quality partition at low cost.

KEYWORDS: *Task-partitioning, Matrix-multiplication, Scientific-computation, Task-scheduling.*

Introduction

A large graph itself is a very complex data structure. These complex graphs have billions of node and trillions of edges as communication links. So, good partition of graph significantly reduces the amount of communication links. Objective of graph partitioning is to allocate vertices into blocks having strong internal connection. Graph partitioning problem can be categorized into two groups : constrained partitioning in which parts of partition can be of same size and second is unconstrained partitioning in which parts of the partition can be of different size. The graph partitioning problem is NP-Complete. However, many algorithms have been developed that find reasonably a good partition. Spectral partitioning method are known to produce good partition problems and they are used quit extensively [4,5]. But these methods are very expensive since they requires the computation of the eigenvector corresponding to the second smallest Eigen value [5,12]. Another class of graph partitioning technique uses the geometric information of the graph to find a good partition. Geometric partitioning algorithm[18,19,20] tend to be fast but often yield partitioning that are worst then those obtained by spectral algorithm. This algorithm produces partition that are probably within the bounds that exist for some special classes of graphs arising in finite element application .Also these methods are much more expensive and the overall complexity of graph partitioning algorithm dominates.

Another class of graph partitioning algorithm reduces the size of the graphs by collapsing the vertices and edges, partitions the smaller graph and then uncoarsen it to construct the partition for the original graph. These are basically called multilevel graph partitioning schemes[1,4,6,7] . This Scheme showed that the multilevel scheme

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