Abstract

Graphics Processing Units (GPUs) are being heavily used in various graphics and non-graphics applications. Many practical problems in computing can be represented as graphs to arrive at a particular solution. These graphs contain very large numbers, up to millions pairs of vertices and edges. In this paper, we present performance analysis of Dijkstra’s single source shortest path algorithm over multiple GPU devices in a single machine as well as over a network of workstations using OpenCL and MPI. Experimental results prove that parallel execution of Dijkstra’s algorithm has good performance when algorithm is run over multi-GPU devices in a single workstation as opposed to multi-GPU devices over a network of workstations. For our experimentation, we have used a workstation having Intel Xeon 6-core Processor; supporting hyper-threading and a total of 24 threads with NVIDIA Quadro FX 3800 GPU device. The two GPU devices are connected by SLI Bridge. Overall, on average we achieved performance improvement up to an order of 10-15x.
Performance Analysis of Single Source Shortest Path Algorithm over Multiple GPUs in a Network of Workstations using OpenCL and MPI


- OpenCL, http://www.khronos.org/registry/cl/
- Parallel Boost Graph Library, http://osl.iu.edu/research/pbgl/
- Andreas Crauser, Kurt Mehlhorn, Ulrich Meyer and Peter Sanders, &quot;A Parallelization of Dijkstra&apos;s Shortest Path Algorithm," &quot; MFCS 1998, pp. 722-731
- Nick Edmonds, Alex Breuer, Douglas Gregor, and Andrew Lumsdaine, &quot;Single-Source Shortest Paths with the Parallel Boost Graph Library," &quot; in 9th {DIMACS} Implementation Challenge: The Shortest Path Problem, November 2006.
- Avi Bleiweiss, &quot;GPU Accelerated Pathfinding," &quot; Graphics Hardware 2008: pp. 65-74
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- The OpenCL specifications www.khronos.org/registry/cl/specs/opencl-1.1.pdf

Index Terms
Computer Science
Algorithms

Keywords
GPU Computing; OpenCL; Multi-node GPU Cluster; Dijkstra’s algorithm; Single source shortest path