

Improve Computation Performance On Large Optimization Problems through Heterogeneous Computing

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Abstract

As the power of graphics processor unit (GPU) increases with multi-cores far more than CPUs to improve the speed of graphics-related computations, the unique characteristics of a GPU is very much suitable for massive parallel computing. Through data exchange and processing between CPU and GPU, the heterogeneous computing holds the promise of higher utilization of hardware platforms and thus more efficient computing than just the CPU computation alone. With the promising computing power, the operations research world could take heed of this new heterogeneous architecture for improving the computation of meta-heuristics especially for large optimization problems through the parallel computing platform called C++ Accelerated Massive Parallelism (AMP). Developed by Microsoft and fully available in Visual Studio 2012, C++ AMP inherently takes advantage of GPU power and computing parallelism for computation. The aim of the research is therefore to investigate the impact of C++ AMP on data-parallel matrix calculation for traditional NP-hard problems, namely Quadratic Assignment Problem (QAP), and compare small, medium and large size problem sets. The results indicate that C++ AMP is potentially valuable when it comes to computing large size problems and can become an important asset in OR researchers' toolbox.

Keywords

Heterogeneous computing, Quadratic assignment problem, Massive parallelism, graphics processing unit

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