
Jose Garcia
Comparing Multigrid Solver Performance on Many-Core Accelerators.

PO Box 3000
Boulder
CO
80307
jgarcia@ucar.edu

Jose Garcia

National Center for Atmospheric Research (NCAR). University of Colorado

Rory Kelly

National Center for Atmospheric Research (NCAR). Multigrid solvers are considered to be the most efficient methods to solve many classes of numerical problems. However, the true performance of these methods depends on their specific implementations for different computer architectures. In recent years the continuing increase in single threaded microprocessor performance has stalled as designs have become bound by fundamental limitations with the underlying device physics. These limitations have ushered in a new era or multi-core, many-core, and heterogenous core processors, aimed at increasing speed through explicit parallelism. For Multigrid algorithms to benefit from this recent trend they must be able to efficiently exploit the parallelism offered by the underlying hardware. We explore the complexities, performance and limitations that Multigrid methods may face when implemented for several current generation accelerators, including the Cell Broadband Engine and NVIDIA Graphics Processing Units.

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