



复旦大学数学科学学院

数学综合报告会

报告题目: Optimizing Multi-grid Computation and Parallelization on Multi-cores

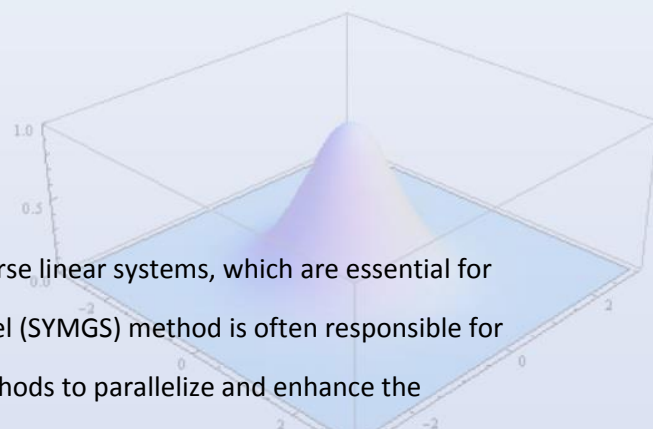
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时间: 2023-04-21 星期五 13:30-14:30

地点: 光华楼东主楼1801室

报告摘要:

Multigrid algorithms are widely used for solving large-scale sparse linear systems, which are essential for many high-performance workloads. The symmetric Gauss-Seidel (SYMGS) method is often responsible for the performance bottleneck of MG. This talk presents new methods to parallelize and enhance the computation and parallelization efficiency of the SYMGS and MG algorithms on multi-core CPUs. Our solution employs a matrix splitting strategy and a revised computation formula to decrease the computation operations and memory accesses in SYMGS. With this new SYMGS strategy, we can then merge the two most time-consuming components of MG. On top of these, we propose a new asynchronous parallelization scheme to reduce the synchronization overhead when parallelizing SYMGS. We demonstrate the benefit of our techniques by integrating them with the HPCG benchmark and a real-life application. Evaluation conducted on four architectures, including three ARMv8 and one x86, shows that our techniques greatly surpass the performance of engineer- and vendor-tuned implementations across various workloads and platforms.



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