The 18th International Conference on Finite Elements in Flow Problems (FEF2015)
16-18 March 2015, Taipei, Taiwan

PSPIKE: A Parallel Hybrid Sparse Linear System Solver

Ahmed H. Sameh and Yao Zhu

[1] Department of Computer Science,
Purdue University, West Lafayette IN 47907, U.S.A.
sameh@cs.purdue.edu
yaozhu@purdue.edu

Key Words: *Sparse matrices, Linear system solvers, Parallel computing*

Rapid advances in high-end computing architectures have posed new challenges in the design of algorithms that are capable of achieving significant parallel scalability, particularly for sparse matrix computations. We present a hybrid solver for large sparse linear systems that is capable of achieving high efficiency on multicore architectures and high degree of parallel scalability on massive distributed memory architectures. This parallel linear system solver – *PSPIKE* – consists of several stages: (i) reordering of the sparse coefficient matrix, (ii) extracting an effective preconditioner, and (iii) applying an outer Krylov subspace method using the preconditioner extracted in the previous stage. All three stages are designed so as to achieve high degree of parallelism. Numerical experiments are presented to demonstrate the robustness and parallel scalability of *PSPIKE* compared to other direct and preconditioned iterative sparse linear system solvers.