A High-Performance Parallel Hybrid Solver for Large Sparse Linear Systems

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In this work we investigate the parallel scalability of variants of additive Schwarz preconditioners for three dimensional non-overlapping domain decomposition methods. To alleviate the computational cost, both in terms of memory and floating-point complexity, we investigate variants based on a sparse approximation or on mixed 32- and 64-bit calculation. The robustness of the preconditioners is illustrated on a set of linear systems arising from the finite element discretization of elliptic PDEs, and from structural mechanical problem through extensive parallel experiments on up to a thousand processors. Their efficiency from a numerical and parallel performance view point are studied. Consequently the size of the linear systems varies from 8 millions to 43 millions unknowns.

References

[1] L. Giraud, A. Haidar, and L. T. Watson. Parallel scalability study of three dimensional additive Schwarz preconditioners in non-overlapping domain decomposition. Technical Report TR/PA/07/05, CERFACS, Toulouse, France, 2007. Also appeared as ENSEEIHT-IRIT Technical report RT/APO/07/01. Also Under reviewing for Parallel Computing

[2] L. Giraud, A. Haidar, and L. T. Watson. Mixed-precision preconditioners in parallel domain decomposition solvers. Technical Report TR/PA/06/84, CERFACS, Toulouse, France, 2006. Also appeared as ENSEEIHT-IRIT Technical report RT/APO/06/08. Accepted for publication in the proceedings of DD17.