

GMRES PRECONDITIONED BY A PERTURBED LDL^T DECOMPOSITION WITH STATIC PIVOTING

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Abstract

A strict adherence to threshold pivoting in the direct solution of symmetric indefinite problems can result in substantially more work and storage than forecast by an sparse analysis of the symmetric problem. One way of avoiding this is to use static pivoting where the data structures and pivoting sequence generated by the analysis are respected and pivots that would otherwise be very small are replaced by a user defined quantity. This can give a stable factorization but of a perturbed matrix.

The conventional way of solving the sparse linear system is then to use iterative refinement (IR) but there are cases where this fails to converge. We will discuss the use of more robust iterative methods, namely GMRES and its variant FGMRES and their backward stability when the preconditioning is performed by HSL_M57 with a static pivot option.

References

- [1] ARIOLI M., DUFF I. S. , GRATTON S., AND PRALET S., *A note on GMRES preconditioned by a perturbed LDL^T decomposition with static pivoting*, RAL-TR-2006-007, 2006.