

Randomized approximate inverse preconditioning

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1 Abstract

In this work we consider the application of randomized approximate inverse LU preconditioners for solving iteratively linear systems of the form $Ax = b$ where $A \in \mathbb{R}^{n \times n}$ is a large nonsymmetric and sparse nonsingular matrix. We solve the systems using Krylov subspaces methods, in particular the BiCGSTAB method.

The preconditioner studied is a randomized version of the V-AISM preconditioner introduced in [2] which is a variant of the AISM preconditioner [1]. V-AISM uses the Sherman–Morrison formula to obtain a factorization of the inverse of a matrix A by applying recursively that inversion formula in a compact representation form. The main computational operation for computing the preconditioner is a matrix-by-matrix product. To improve the performance of the algorithm these operations are approximated as the product of some randomly selected rows and columns of the matrices to be multiplied. To test the performance of the proposed randomized algorithm the results of numerical experiments with different matrices will be presented.

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References

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