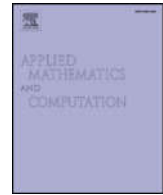




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A block version of left-looking AINV preconditioner with one by one or two by two block pivots

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ABSTRACT

In this paper, we present a block format of left-looking AINV preconditioner for a nonsymmetric matrix. This preconditioner has block 1×1 or 2×2 pivot entries. It is introduced based on a block format of Gaussian Elimination process which has been studied in [14]. We have applied the multilevel nested dissection reordering as the preprocessing and have compared this block preconditioner by the plain left-looking AINV preconditioner. If we mix the multilevel nested dissection by the maximum weighted matching process, then the numerical experiments indicate that the number of 2×2 pivot entries in the block preconditioner will grow up. In this case, the block preconditioner makes GMRES method convergent in a smaller number of iterations. In the numerical section, we have also compared the ILUT and block left-looking AINV preconditioners.

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1. Introduction

Consider the linear system of equations

$$Ax = b, \quad (1)$$

where $A \in \mathbb{R}^{n \times n}$ is nonsingular, large, sparse and nonsymmetric and also $x, b \in \mathbb{R}^n$. Solving such a system which arises in many areas of applied sciences is still a great challenge. Krylov subspace methods are among the iterative methods to solve such a system [16]. When this system is ill-conditioned and hard to solve, then it is better to apply the preconditioning techniques.

An ILU preconditioner M for system (1) is the following

$$A \approx M = LDU, \quad (2)$$

in which L and U^T are unit lower triangular matrices and D is a diagonal matrix. With this preconditioner, we can change the original system to $AM^{-1}u = b$, where $M^{-1}u = x$ and then we can solve this right-preconditioned system by the Krylov

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