Projection method combining preconditioners for solving large and sparse linear systems

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Abstract

Solving the sparse and large size linear systems is an important problem in linear algebra and have so many complex applications. One of the iterative methods for solving linear systems is Full Orthogonalization Method (FOM). In this paper, the iterative FOM method is described and for faster convergence some Incomplete preconditioners and Incremental Incomplete preconditioners are Combined with this method and results show converage rate of this preconditioners are faster.

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1 Introduction

One of the most important problems in linear algebra is solving the linear system Ax=b. Two types of methods for solving linear systems are Direct methods and Iterative methods.

The direct methods consist of a finite number of steps that all must be performed for any given instance before the solution is obtained, on the other hand, iterative methods are by choosing initial solution x and computing a sequence of approximations to the solution x and computation stops whenever a certain desired accuracy is obtained or after certain number of iterations [3].

The iterative methods are used primarily for large and sparse systems and should write the system Ax=b in an equivalent form:

$$x = Bx + r \tag{1}$$

then, starting with an initial approximation $x^{(1)}$ of the solution vector x and generate a sequence of approximation $\{x^{(k)}\}$ iteratively defined by

$$x^{(k+1)} = Bx^{(k)} + r \qquad k = 1, 2, \cdots . \tag{2}$$

One of these methods is Full Orthogonalization Method(FOM) .

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