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论文

基于多层增量未知元方法的一类三维对流扩散方程的研究

(兰州大学数学与统计学院 兰州 730000)

摘要:

对于一类一般形式的三维对流扩散方程, 运用有限差分方法, 在增量未知元方法(IU)下, 可以得到一个IU型正定但非对称的线性方程组.其系数矩阵条件数要远远优于不用IU方法的情形[1]. 考虑到IU方法的这一优点, 作者在文中将IU方法与几种经典的迭代方法相结合, 来求解上述系统. 作者从理论上对该系统的IU型系数矩阵条件数进行了估计, 并通过数值试验验证了这几种IU型迭代方法的有效性.

关键词: 增量未知元方法 对流扩散方程 迭代方法

分类号:

65N; 65F

A Class of Generalized Three Dimensional Convection-Diffusion Equations with Multi-Level Incremental Unknowns Method

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Abstract:

With the finite difference discretization techniques, the authors get a nonsymmetric and positive-definite linear system when considering a class of generalized three-dimensional convection-diffusion equations even if they have variable coefficients. Considering that the condition number of incremental unknowns (IU)-type coefficient matrix is much better than the matrix without IU(see [1]), the authors use the IU method in conjunction with several classical iterative methods to approximate the solution of the system. After estimating the condition number of IU-type
coefficient matrix, the authors numerically confirm that these IU-type iterative methods are much more efficient.

Keywords: Incremental unknowns Convection-diffusion equations with variable coefficients Iterative methods

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