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非对称稀疏线性方程组的快速外存解法及其在无网格法计算中的应用

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摘要: 针对局部Petrov-Galerkin无网格法(MLPG)等无网格方法的计算所产生的大型非对称稀疏线性方程组, 介绍了一种新的直接解法. 与一般非对称求解过程不同, 该解法从现有的对称正定解法中演变出来, 其分解过程在矩阵的上、下三角阵中对称进行. 新的矩阵分解算法可以通过修改对称矩阵分解算法的代码来实现, 这提供了从对称解法到非对称解法的快捷转换. 还针对MLPG法以及有限元法所产生的方程组开发了多块外存算法(multi-blocked out-of-core strategy)来扩大求解规模. 测试结果证明该方法大幅度提高了大型非对称稀疏线性方程组的求解速度.

关键词: 稀疏矩阵; 线性方程组; 无网格法; 高性能计算

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