

PRECONDITIONED CONJUGATE GRADIENT SOLVER FOR STRUCTURAL PROBLEMS

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ABSTRACT

Matrix solvers play a crucial role in solving real world physics problem. In engineering practice, transition analysis is most often used, which requires a series of similar matrices to be solved. However, any specific solver with/without preconditioner cannot achieve high performance gain for all matrices. This paper recommends Conjugate Gradient iterative solver with SSOR approximate inverse preconditioner for general engineering practice instead of Conjugate Gradient alone. The author uses experiments on 125 symmetric positive definite matrices derived from real structural problems to endorse this recommendation. SSOR approximate inverse preconditioner shows a competitive advantage to provide stable performance improvement (average 12.6x speedup to CG). And, a general setting ($\omega = 0.01$) will effectively prevent the failure of SSOR approximate inverse preconditioner among a wide range of data derived from analysis of structural problems.