SM19L_12606

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Parallel Multilevel Solution of Large-Scale Nonlinear Shell Problems

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The analysis of largescale nonlinear shell problems asks for parallel simulation approaches. One crucial part of efficient and well scalable parallel FE-simulations is the solver for the system of equations. Due to the inherent suitability for parallelization one is very much directed towards preconditioned iterative solvers. However thin walled structures discretized by finite elements lead to illconditioned system matrices and therefore performance of iterative solvers is generally poor. This situation further deteriorates when the thickness change of the shell is taken into account. A preconditioner for this challenging class of problems is presented combining two approaches in a parallel framework. The first one is based on a scaling of the shell director only for solution purpose. The second approach utilizes an aggregation multigrid concept. It is demonstrated by several numerical examples that both approaches allow to remedy the illconditioning of the underlying problem.

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