SYMMETRIC, NONSYMMETRIC AND NONLINEAR SPACE DECOMPOSITION PRECONDITIONERS WITH APPLICATIONS

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Abstract

The contribution considers iterative methods based on space decomposition - subspace correction strategy. These iterative methods are suitable for implementation on parallel computers and application to the solution of large linear systems arising from the mathematical modelling of various phenomena. A special focus will be given to space decompositions via displacement decomposition for elasticity problems, domain decomposition and decomposition of the composite mesh FE spaces. For all cases, both symmetric and nonsymmetric preconditioners will be considered. Moreover, the subspace corrections will be allowed to be solved by inner iterations, which are convenient in many respects as also for balancing of the ratio between the amount of computations and communications during the parallel processing. The use of general inner solvers gives nonlinear preconditioners, which can be implemented within the generalized preconditioned CG method. Beside the description of the methods and the corresponding theory, many numerical tests and an application of the considered methods to the solution of a benchmark problem from a large-scale real-life modelling in geomechanics will be given. The large-scale application shows also the efficiency of computations performed on a small cluster of PC's.

References

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