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Einladung zum Seminar
Numerische Mathematik und Mechanik

31. Januar 2005, 11:00 - 12:00 Uhr, T03 R03 D26

Prof. Dr. Olof Widlund, Courant Institute, New York

Domain Decomposition Methods Based on Cholesky's Algorithm

The often very large linear systems of algebraic equations which arise in finite element analysis of linear elasticity and other applications are traditionally solved directly using a Cholesky factorization in engineering software systems. Considerable and steady progress is being made in the deployment of efficient solvers of this kind. In this talk, an alternative approach will be explored, which has been proven quite successful even on massively parallel computers.

Domain decomposition methods are preconditioned iterative methods often using conjugate gradients. The preconditioners are often built from direct Cholesky solvers for problems on the subdomains and a global component which is necessary to ensure scalability, i.e., a convergence rate which is independent of the number of subdomains into which the original elastic body, etc., has been divided. We will demonstrate that FETI-DP and BDDC algorithms can be built from a few simple components of which a Cholesky solver is the most important. This framework also highlights the close relationship between these two families of algorithms. We will also touch on the design of multi-level algorithms and the extension to certain saddle point problems.

The research reported is the result of two projects conducted jointly with Axel Klawonn and Oliver Rheinbach of the University of Essen, Germany and with Jing Li of Kent State University.

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