Mathematisches Seminar

des DFG-Sonderforschungsbereichs 393

Numerische Simulation auf massiv parallelen Rechnern

Zeit:	Freitag, 30.06.2000, 11:45 Uhr
Ort:	Reichenhainer Straße 70, B 202
Vortragender:	**M. Tuma** (Prag)
Thema:	**Factorized Block Approximate Inverse Preconditioning**

The solution of large and sparse symmetric positive definite linear systems by the preconditioned conjugate gradient method is considered. In the last few years there has been considerable interest in explicit preconditioning techniques based on directly approximating the inverse of the coefficient matrix with a sparse matrix. Sparse approximate inverses have been shown to result in good rates of convergence of the preconditioned iteration (comparable to those obtained with incomplete factorization methods) while being well-suited for implementation on vector and parallel architectures. Because the application of the preconditioner reduces to matrix-vector products, parallelization with reasonable parallel speedups is straightforward. Nevertheless, local processor performance could be low.

In the talk some recent results on block preconditioning, with special emphasis on factorized approximate inverse techniques, will be presented. In contrast with the standard approach for block iterative solvers, our preconditioner construction is based on approximate or complete graph compression procedures which determine the block structure from an assembled matrix. This strategy is viable also for systems arising from unstructured grids and, in particular, for systems where the underlying application results in an inherent grouping of degrees of freedom, as can be the case for matrices arising from finite element discretizations or after static condensation.

Block preconditioning methods, and particularly their stabilized variants, are of interest not only because of their superior performance; they are also important from the point of view of their reliability, which is paramount in industrial applications. Results of numerical experiments with block and stabilized approximate inverse preconditioners for problems in solid and structural mechanics will be presented.

The talk is based on joint work with Michele Benzi and Reijo Kouhia.

References

- C. Ashcraft. Compressed graphs and the minimum degree algorithm, *SIAM J. Sci. Comput.*, 16:1404-1411, 1995.
- M. Benzi, J. K. Cullum and M. Tuma. Robust approximate inverse preconditioning for the conjugate gradient method, *SIAM J. Sci. Comput.*, to appear.
- M. Benzi, C. D. Meyer and M. Tuma. A sparse approximate inverse preconditioner for the conjugate gradient method, *SIAM J. Sci. Comput.*, 17:1135-1149, 1996.

Das Seminar wird von Prof. Mehrmann geleitet. Interessenten sind herzlich eingeladen.