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Parallel Computing 27 (2001) 867–868

PARALLEL COMPUTING

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Guest editorial

# Linear systems and associated problems

The special issue on aspects of parallel computing for linear systems and associated problems contains selected papers from ParCo99. The International Conference ParCo99 was held in August 1999 in Delft, The Netherlands, i.e., during one of the last few months of the century during which the first electronic and parallel computers were developed. The invited and contributed papers at the conference gave a retrospective view of what has been achieved in the parallel computing field during the past three decades, as well as a prospective view of expected future developments. From the many papers at the conference the ones presented in the special issue were selected giving such a view in a selected area of parallel processing.

The paper of Basermann, Fingberg, Lonsdale, Maerten and Walshaw deals with dynamic re-partitioning of meshes for parallel finite element problems. The authors discuss the possibility of achieving load balance for finite element computations. They show that this is possible for complicated industrial applications and they report on the level of load balance that has been achieved in actual computations. This makes the paper of interest for those who want to know whether dynamic load balancing can be a realistic tool for industrial applications.

In the paper by Geus and Röllin, three methods are presented for the multiplication of a sparse symmetric matrix with a vector. The speedup of their implementation on an eight processor system is reported and compared to a straightforward implementation. The authors present an interesting comparison of the speedup on different systems for their latency hiding multiplication algorithm. It also shows the important gains obtainable by tuning a straightforward algorithm.

The paper by Heras, Cabaleiro, and Rivera has as objective to model locality and to correlate locality with cache misses. It is original in the sense that it focusses on sparse matrices and uses a kind of Hamming distance between rows to measure the likelihood that adjacent data will be stored in the cache.

Cooper, Szularz and Weston present results on computing the extreme eigenpairs of large, sparse symmetric matrices by using the Lanczos algorithm in a distributed memory environment. The authors report a significant improvement on a Cray T3D over the LExpRes (Lanczos Explicit Restart) method to overcome the divergence of the Lanczos method.

The paper by Lin presents a nice graph-theoretical unifying framework for tridiagonal system solvers. The framework comprises three basic types of graph transformation operations. As such, it provides a unified description of many known parallel algorithms for the solution of tridiagonal systems.


PII: S0167-8191(01)00069-2

A complete different domain of parallel applications is covered by the paper of Christen, Hegland, Nielsen, Roberts, Strazdins and Atlas. They present parallel scalable algorithms for high dimensional surface fitting and predictive modeling. This paper fits well into the scope of the *Parallel Computing* journal, since it is application oriented and tries to enlarge the scope of the domains where parallel computing is applied.

Finally, the paper by Bergamaschi, Pini and Sartoretto on parallel preconditioning of a sparse eigensolver discusses a number of methods to accelerate the computation of the leftmost eigenvalues of a sparse symmetrical matrix. The paper contains a well-theoretical background and results.

## Acknowledgements

Editing this issue of *Parallel Computing* would not have been possible without the help of the referees. We appreciate their careful evaluation of the submitted papers. Special thanks are due to Gerhard Joubert for his encouragement in preparing this special issue.

Delft, 20 February 2001

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