Topic 11
Numerical Algorithms

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Topic Chairs

Fast and reliable parallel algorithms for the basic problems of numerical mathematics and their effective implementation in easy-to-use portable software components are crucial for computational solution of scientific and engineering problems. This Topic track is a forum for the presentation and discussion of new developments in the field of parallel numerical algorithms, covering all aspects from basic algorithms, efficient implementation on modern parallel, distributed and network-based architectures, to software design and prototyping in mathematical software components and performance analysis. Specific areas of interest include, among others, PDEs, large sparse or dense linear systems and eigensystems, non-linear systems, linear algebra and fast transforms.

Overall, fifteen papers were submitted to our Topic. Out of these fifteen submissions, six were accepted, all of them as regular papers. At the conference, the presentations were arranged into two sessions, containing three papers each of them. The first session starts out with a presentation investigating the old history effect in asynchronous iterations on a linear least squares problem. A partially asynchronous algorithm is developed. It is experimentally shown the effectiveness of a combined effort to decrease the effect of old history. The second paper presents a study of mixed parallel execution schemes for explicit and implicit variants of general linear methods. Experiments conducted in two different parallel platforms show interesting results. The final paper in this session proposes a data management and communication layer for an adaptive, hexahedral finite element method on distributed memory machines. The layer also provides an effective user interface.

The second session consists of three papers. The first concerns a splitting approach to the pressure-stabilized Petrov-Galerkin (PSPG) finite element method for incompressible flow. A parallel implementation of the method is described showing a good scalability for large systems. The next paper deals with a parallel direct solver for solving large sparse linear systems. A modification of a multilevel graph partitioning schema is proposed for a balanced domain decomposition of the problem. The last paper is about parallel hybrid algorithms for solving the triangular continuous-time Sylvester equation. It is shown that these algorithms outperform parallel implementations of the DTRSYL solver from LAPACK.

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