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EDITORIAL

Preface to BIT 53:2

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A sizable part of this regular issue deals with large systems of equations, and specially to those arising from approximation and data analysis applications. By tradition, we describe a problem solving chain, starting with building a mathematical model, then discretizing this, later solving a linear system and finally displaying the result. And normally this division of labor is an advantage! I take the matrix and device an algorithm that gets the most out of it. But the origin of the matrix tells me quite a lot about how it is expected to behave. The matrix is not just a matrix, it may have come from a discretized PDE or from an image reconstruction task. These issues are discussed in several of the papers here.

These are the papers:

In the first paper, *James Baglama* and *Lothar Reichel* discuss block Lanczos bidiagonalization, the first part of an iterative method to compute the singular value decomposition of a large rectangular matrix. They use Leja shifts to accelerate the convergence of an implicit restart procedure.

Mario Bebendorf, *Matthias Bollhöfer*, and *Michael Bratsch* represent a large matrix as a hierarchical matrix. Approximation with low rank blocks need less computations. Constraints that preserve invariant subspaces are derived. The approach is useful as a preconditioner for iterative conjugate gradient multigrid solution of PDE problems.

Tomas Björk, *Anders Szepessy*, *Raul Tempone*, and *Georgios Zouraris* study Monte Carlo Euler approximations of Heath-Jarrow-Morton term structure financial models. Weak convergence estimates of the underlying Itô stochastic differential equation are derived. Several numerical experiments are reported.

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Jesús M. Carnicer, *Jorge Delgado*, and *Juan M. Peña* describe how to compute a surface interpolation. A Richardson iterative method is used to solve the linear system that gives the control polygon as its solution. The method is illustrated on tensor product and triangular surfaces.

Michael S. Floater and *Bartłomiej P. Siwek* analyze the regularity of a function given as local interpolation polynomials over the parts of an interval subject to Hermite subdivision.

Yong-Xia Hao, Chong-Jun Li, and *Ren-Hong Wang* solve the quasi-Plateau problem of finding a minimal surface with a prescribed boundary. A multiresolution scheme with B spline patches is used. The convergence of four different iterations is investigated.

Rong Huang describes a diagonal pivoting scheme for the factorization of a symmetric totally nonpositive matrix. It is shown that the well known Bunch Parlett scheme can be executed with few comparisons and bounded element growth factor.

Thomas Huckle and *Matous Sedlacek* study how to recover the original information from blurred signals in the presence of Gaussian white noise. A data based regularization is imposed on the least squares problem. Its behavior is illustrated on some well known image reconstruction test cases.

Max Jensen and *Axel Målqvist* prove the strong convergence of Galerkin approximations to finite energy solutions of the Joule heating problem in three dimensions with mixed boundary conditions. Only mild conditions are imposed on the boundary data.

Mihály Kovács, Stig Larsson, and *Fredrik Lindgren* analyze weak convergence of finite element approximations to linear stochastic evolution equations. The difference between strong and weak convergence, as well as the advantage of higher order methods is established. The results are applied to the linearized Cahn-Hilliard-Cook equation and the stochastic heat equation.

Ioana Pantelimon and *Constantin Popa* discuss the advantage of adding constraints to the linear least squares problem of an image reconstruction problem. Adaptive constraints are used in conjunction with the standard Kaczmarz, Cimmino, Jacobi Projective and Diagonal Weighting iterations.

Kholmat M. Shadimetov and *Abdullo R. Hayotov* describe construction of interpolation splines minimizing a Hilbert space seminorm. Such splines are exact for polynomials of low degree and exponential functions.

I wish you all welcome to read this new issue,

Axel Ruhe