Structure preserving algorithms

Beata Laszkiewicz

Wrocław University of Technology, Poland

Abstract

In recent years interests in the structure preserving algorithms and structured tools for structured matrices have increased (see for example [1]-[5]). In the talk we review some properties of the structure preserving functions in automorphism groups associated with bilinear or sesquilinear forms. For example, the principal square root is a function that preserves every automorphism group.

We present numerical experiments with algorithms for computing the polar decomposition and the matrix sign decomposition in matrix groups.

Keywords

Structured matrix, Structure preserving function, Polar decomposition, Matrix sign, Matrix square root.

References

[1] Benner, P., V. Mehrmann, and H. Xu (1998). A numerically stable, structure preserving method for computing the eigenvalues of real Hamiltonian or sympletic pencils. *Numerische Math. 78*, 329-358.

[2] Benner, P., D. Kressner, and V. Mehrmann (2003). Structure preservation: a challenge in computational control. *Future Generation Computer Systems 19*, 1243-1252.

[3] Higham, N.J., D.S. Mackey, N. Mackey, and F. Tisseur (2004). Computing the polar decomposition and the matrix sign decomposition in matrix groups. *SIAM J. Matrix Anal. Appl.*, *SIAM J. Matrix Anal. Appl. 25*, 1178-1192.

[4] Higham, N.J., D.S. Mackey, N. Mackey, and F. Tisseur (2004). Functions preserving matrix groups and iterations for the matrix square root. *SIAM J. Matrix Anal. Appl.*, to appear.

[5] Mackey, D.S., N. Mackey, and F. Tisseur (2003). Structured tools for structured matrices. *Electr. J. Linear Algebra 10*, 106-145.