Rational Lanczos Methods for the Approximation of Matrix Functions

Lothar Reichel
Kent State University, United Kingdom

The need to evaluate expressions of the form f(A)v, where A is a large, sparse or structured, and symmetric matrix, v is a vector, and f is a nonlinear function, arises in many applications. The extended Krylov subspace method can be an attractive scheme for computing approximations of such expressions. This method projects the approximation problem onto an extended Krylov subspace of fairly small dimension, and then solves the small approximation problem so obtained. An orthogonal basis for this subspace can be generated using short recursion formulas. These formulas are derived using properties of Laurent polynomials. The matrix of the projected problem is pentadiagonal. We will discuss its structure and present applications. The talk presents joint work with C. Jagels.