LOOK-AHEAD PROCEDURES FOR LANCZOS-TYPE PRODUCT METHODS BASED ON THREE-TERM LANCZOS RECURRENCES

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Abstract

Lanczos-type product methods for solving large sparse non-Hermitian linear systems have as residual polynomials either the squares of the Lanczos polynomials or the products of the latter with another sequence of polynomials, which is normally chosen to enforce some local minimization of the residual norm. In either case, these methods inherit from the underlying Lanczos process the danger of breakdown; in all but very exceptional situations breakdowns and near-breakdowns can be circumvented by look-ahead.

The construction of the iterates and residuals of Lanczos-type solvers is based either on a three-term recurrence or a pair of coupled two-term recurrences for the Lanczos polynomials and formally similar recursions for the other polynomial sequence. For all cases we present look-ahead algorithms that have, in general, lower overhead in memory and computations than the previously suggested algorithms (Brezinski and Redivo Zaglia, 1995; Gutknecht and Ressel, 1996).

This talk is based on joint work with Klaus Ressel [1]

References

[1] M. H. Gutknecht and K. J. Ressel, Look-ahead procedures for Lanczos-type product methods based on three-term Lanczos recurrences, SIAM J. Matrix Anal. Appl., 21 (2000), pp. 1051–1078.