A NUMERICAL STUDY OF ACCELERATION SCHEMES FOR RESTARTED MINIMUM RESIDUAL METHODS

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Abstract

The two main approaches for solving linear systems of equations with Krylov subspace methods differ in the schemes used to generate suitable basis vectors for computing corrections to the approximate solution. In the early 90s, the introduction of look-ahead techniques to stabilize the Lanczos process along with the QMR method made biorthogonalization methods an attractive approach due to their (for all practical purposes) linear cost in storage and arithmetic. Moreover, these methods, even if used without look-ahead techniques, often outperform those based on orthogonalisation, the second main approach, which is because these methods need to be restarted or truncated in order to make their application feasible.

Recently a number of acceleration techniques have been proposed which attempt to compensate for the effects of restarting and truncation, thus closing the gap between orthogonalisation and biorthogonalisation methods.

Our modest contribution is to complement our recent analysis [1] of three of the more popular of these acceleration schemes with a careful numerical study which attempts to identify the strengths and weaknesses of each scheme.

References

[1] M. Eiermann, O. Ernst and O. Schneider. Analysis of Acceleration Strategies for Restarted Minimal Residual Methods, J. Comp. Appl. Math. **123** (2000) pp. 262–292