

On the approximation of low-rank rightmost eigenpairs of a class of matrix linear operators

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We are interested in computing the rightmost eigenpairs of a linear matrix valued operator. We make a priori the hypothesis (as this is a common property of several applications) for which the corresponding eigenmatrix has quickly decaying singular values. This allows us to constrain to a low-rank manifold the search of approximate eigensolutions. Thanks to the solution of an appropriate ordinary differential equation, we are able to approximate the rightmost eigenpair of the linear operator. From the analysis of the behaviour of such ODE on the whole space, we conclude that, under generic assumptions, the solution converges globally to its leading eigenmatrix, when the rightmost eigenvalue is simple and real. After that, we project the differential equation on a low-rank manifold of prescribed rank. The projected operator is nonlinear and this makes the analysis more subtle. Finally, we propose two explicit numerical methods. The numerical experiments show that the approach is effective and competitive.

Joint work with N. Guglielmi and D. Kressner.

References

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