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Efficient evaluation of matrix polynomials. (English) Zbl 1432.65029
Linear Algebra Appl. 539, 229-250 (2018).

Summary: This paper presents a new family of methods for evaluating matrix polynomials more efficiently than the state-of-the-art Paterson-Stockmeyer method. Examples of the application of the methods to the Taylor polynomial approximation of matrix functions like the matrix exponential and matrix cosine are given. Their efficiency is compared with that of the best existing evaluation schemes for general polynomial and rational approximations, and also with a recent method based on mixed rational and polynomial approximants.

For many years, the Paterson-Stockmeyer method has been considered the most efficient general method for the evaluation of matrix polynomials. In this paper we show that this statement is no longer true. Moreover, for many years rational approximations have been considered more efficient than polynomial approximations, although recently it has been shown that often this is not the case in the computation of the matrix exponential and matrix cosine. In this paper we show that in fact polynomial approximations provide a higher order of approximation than the state-of-the-art computational methods for rational approximations for the same cost in terms of matrix products.

MSC:

[65D99](#) Numerical approximation and computational geometry (primarily algorithms)
[15A99](#) Basic linear algebra
[65Y05](#) Parallel numerical computation

Cited in 7 Documents

Keywords:

[matrix](#); [polynomial](#); [rational](#); [mixed rational and polynomial](#); [approximation](#); [computation](#); [matrix function](#)

Software:

[LAPACK](#); [mfttoolbox](#)

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