Bounds for variable degree rational $L_\infty$ approximations to the matrix cosine. (English)

Zbl 1348.65083

Summary: In this work we derive new alternatives for efficient computation of the matrix cosine which is useful when solving second order Initial Value Problems such as free vibration. We focus especially on the two classes of normal and nonnegative matrices and we present intervals of applications for rational $L_\infty$ approximations of various degrees for these types of matrices in the lines of G. I. Hargreaves and N. J. Higham [Numer. Algorithms 40, No. 4, 383–400 (2005; Zbl 1084.65039)]. Our method relies on Remez algorithm for rational approximation while the innovation here is the choice of the starting set of non-symmetrical Chebyshev points. Only one Remez iteration is then usually enough to quickly approach the actual $L_\infty$ approximant.

MSC:
65F60 Numerical computation of matrix exponential and similar matrix functions
65D15 Algorithms for approximation of functions
41A50 Best approximation, Chebyshev systems
15A16 Matrix exponential and similar functions of matrices

Keywords:
matrix cosine; rational $L_\infty$ approximation; Remez algorithm

Software:
Matlab; mftoolbox; mctoolbox; SLEEF

Full Text: DOI

References:

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