

عنوان مقاله:

Approximating the matrix exponential, sine and cosine via the spectral method

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نویسندگان:

Arezo Shakeri - *Department of Mathematics and Physics, Faculty of Science and Technology, University of Stavanger, Stavanger, Rogaland, Norway*

Mahmoud Behroozifar - *Department of Mathematics, Faculty of Science, Babol Noshirvani University of Technology, Babol, Mazandaran, Iran*

خلاصه مقاله:

This article is arranged to introduce three different algorithms for computing the matrix exponential, cosine and sine functions A^t for $0 \leq t \leq b$, for all $b \in \mathbb{R}^+$. To achieve this purpose, we deal with the spectral method based on Bernstein polynomials. Bernstein polynomials are briefly introduced and utilized to approximate the functions. The operational matrix of integration of Bernstein polynomials is stated and employed to reduce the dynamic systems to the linear algebraic systems. It is required to solve n linear algebraic systems for evaluating the matrix functions. By presenting the CPU time, it is displayed that the methods require a low amount of running time. Also, error analysis is discussed in detail. The outstanding point of this method is that the approximate exponential, cosine and sine matrix A_{t_0} , for all $t_0 \in [0, L]$ can be obtained with only one execution of the algorithm. These three different algorithms have common parts that can be used to practically reduce the computational volume. Some examples are provided to show the high performance of the methods.

کلمات کلیدی:

Matrix exponential function, Matrix cosine function, Matrix sine function, Spectral method, Operational matrix of integration, Bernstein polynomial

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