

Accepted Manuscript

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PII: S0377-0427(18)30534-X
DOI: <https://doi.org/10.1016/j.cam.2018.08.047>
Reference: CAM 11884

To appear in: *Journal of Computational and Applied Mathematics*

Received date: 29 January 2018
Revised date: 6 July 2018

Please cite this article as: E. Defez, J. Ibáñez, J. Peinado, J. Sastre, P. Alonso-Jordá, An efficient and accurate algorithm for computing the matrix cosine based on new Hermite approximations, *Journal of Computational and Applied Mathematics* (2018), <https://doi.org/10.1016/j.cam.2018.08.047>

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An efficient and accurate algorithm for computing the matrix cosine based on New Hermite approximations[☆]

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Abstract

In this work we introduce new rational-polynomial Hermite matrix expansions which allows us to obtain a new accurate and efficient method for computing the matrix cosine. This method is compared with other state-of-the-art methods for computing the matrix cosine, including a method based on Padé approximants, showing a far superior efficiency, and higher accuracy. The algorithm implemented on the basis of this method can also be executed either in one or two NVIDIA GPUs, which demonstrates its great computational capacity.

Keywords: matrix cosine, scaling and squaring method, Hermite series, forward error, parallel implementation, GPUs, CUDA.

1. Introduction and Notation

The computation of matrix trigonometric functions has received remarkable attention in the last decades due to its usefulness in the solution of

[☆]This work has been partially supported by Spanish Ministerio de Economía y Competitividad and European Regional Development Fund (ERDF) grants TIN2014-59294-P, and TIN2017-89314-P.

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