

Geometric means of more than two matrix sequences in the case of hidden (asymptotic) structures

Monday, 20 January 2025 16:00 (2 hours)

We consider the spectral distribution of the geometric mean of two or more Hermitian positive definite (HPD) matrix-sequences, under the assumption that all input matrix-sequences belong to the same Generalized Locally Toeplitz (GLT) $*$ -algebra. As expected, the numerical experiments show that the geometric mean of k positive definite GLT matrix-sequences forms a new GLT matrix-sequence, with the GLT symbol given by the geometric mean of the individual symbols. While the result is plain for $k = 2$, it is highly non trivial for $k > 2$, due to the limit process for defining the geometric mean and due to the lack of a closed form expression. Theoretical tools for handling the difficult case are discussed.

1. G. Barbarino, C. Garoni, S. Serra-Capizzano, *Block generalized locally Toeplitz sequences: theory and applications in the unidimensional case*, *Electr. Trans. Numer. Anal.* 53 (2020), pp. 28–112.
2. G. Barbarino, C. Garoni, S. Serra-Capizzano, *Block generalized locally Toeplitz sequences: theory and applications in the multidimensional case*, *Electr. Trans. Numer. Anal.* 53 (2020), pp. 113–216.
3. D.A. Bini, B. Iannazzo, *Computing the Karcher Mean of Symmetric Positive Definite Matrices*, *Linear Algebra and its Applications*, 438 (2013), pp. 1700–1710.
4. C. Garoni, S. Serra-Capizzano, *Generalized locally Toeplitz sequences: theory and applications. Vol. I*, Springer, Cham, 2017.
5. C. Garoni, S. Serra-Capizzano, *Generalized locally Toeplitz sequences: theory and applications. Vol. II*, Springer, Cham, 2018.
6. M.F. Khan, S. Serra-Capizzano, *Geometric means of more than two matrix-sequences in the case of hidden (asymptotic) structures*, preprint 2024.

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