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

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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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