MATRICES WITH TOTALLY POSITIVE POWERS AND THEIR GENERALIZATIONS

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Abstract. In this paper, eventually totally positive matrices (i.e. matrices all whose powers starting at some point are totally positive) are studied. We present a new approach to eventual total positivity which is based on the theory of eventually positive matrices. We mainly focus on the spectral properties of such matrices. We also study eventually J-sign-symmetric matrices and matrices, whose powers are $P$-matrices.

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REFERENCES

[1] T. ANDO, Totally positive matrices, Linear Algebra Appl. 90 (1987), 165–219.
[2] A. BERMAN, M. CATRAL, L. M. DEALBA, A. ELHASHASH, F. J. HALL, L. HOGBEN, I. KIM, D. D. OLESKY, P. TARAZAGA, M. J. TSATSOMEROS AND P. VAN DEN DRIESSCHE, Sign patterns that allow eventual positivity, ELA 19 (2010), 108–120.
[3] A. BERMAN AND R. J. PLEMMONS, Nonnegative Matrices in the Mathematical Sciences, Academic Press, New York, 1979.
[4] A. ELHASHASH, Characterizations of matrices enjoying the Perron–Frobenius property and generalizations of $M$-matrices which may not have nonnegative inverses, Ph.D., Temple University, 2008.
[5] A. ELHASHASH AND D. B. SZYLD, Two characterizations of matrices with the Perron–Frobenius property, Numer. Linear Algebra Appl. 16 (2009), 863–869.
[6] A. ELHASHASH AND D. B. SZYLD, On general matrices having the Perron–Frobenius property, ELA 17 (2008), 389–413.
[7] E. M. ELLISON, L. HOGBEN AND M. J. TSATSOMEROS, Sign patterns that require eventual positivity or require eventual nonnegativity, ELA 19 (2009–2010), 98–107.
[8] SH. FALLAT AND C. R. JOHNSON, Totally nonnegative matrices, Princ. Univ. Press, 2011.
[9] M. FIEDLER AND V. PTÁK, On matrices with non-positive off-diagonal elements and positive principal minors, Czech. Math. J. 22 (87) (1962), 382–400.
[10] S. FRIEDLAND, On an inverse problem for nonnegative and eventually nonnegative matrices, Israel Journal of Mathematics 29 (1978), 43–60.
[11] F. GANTMACHER, The Theory of Matrices, Volume 1, Volume 2, Chelsea. Publ. New York, 1990.
[12] F. R. GANTMACHER AND M. G. KREIN, Oscillation Matrices and Kernels and Small Vibrations of Mechanical Systems, AMS Bookstore, 2002.
[13] I. M. GLAZMAN AND YU. I. LIUBICH, Finite-Dimensional Linear Analysis: A Systematic Presentation in Problem Form, MIT Press, 1974.
[14] C. R. JOHNSON AND P. TARAZAGA, On Matrices with Perron–Frobenius Properties and Some Negative Entries, Positivity 8 (2004), 327–338.
[15] O. Y. KUSHEL, Cone-theoretic generalization of total positivity, Linear Algebra Appl. 436 (2012), 537–560.
[16] D. NOUTSOS, On Perron–Frobenius property of matrices having some negative entries, Linear Algebra Appl. 412 (2006), 132–153.
[17] A. PINKUS, Totally positive matrices, Cambridge University Press, 2010.
[18] P. TARAZAGA, M. RAYDAN AND A. HURMAN, *Perron–Frobenius theorem for matrices with some negative entries*, Linear Algebra Appl. 328 (2001), 57–68.