

ON SPECTRA PERTURBATION AND ELEMENTARY DIVISORS OF POSITIVE MATRICES*

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Abstract. A remarkable result of Guo [Linear Algebra Appl., 266:261–270, 1997] establishes that if the list of complex numbers $\Lambda = \{\lambda_1, \lambda_2, \dots, \lambda_n\}$ is the spectrum of an $n \times n$ nonnegative matrix, where λ_1 is its Perron root and $\lambda_2 \in \mathbb{R}$, then for any $t > 0$, the list $\Lambda_t = \{\lambda_1 + t, \lambda_2 \pm t, \lambda_3, \dots, \lambda_n\}$ is also the spectrum of a nonnegative matrix. In this paper it is shown that if $\lambda_1 > \lambda_2 \geq \dots \geq \lambda_n \geq 0$, then Guo's result holds for positive stochastic, positive doubly stochastic and positive symmetric matrices. Stochastic and doubly stochastic matrices are also constructed with a given spectrum and with any legitimately prescribed elementary divisors.

Key words. Stochastic matrix, Doubly stochastic matrix, Symmetric matrix, Spectrum perturbation, Elementary divisors.

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