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# 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 $\Lambda = \{\lambda_1, \lambda_2, \ldots, \lambda_n\}$ is the spectrum of an $n \times n$ nonnegative matrix, where $\lambda_1$ is its Perron root and $\lambda_2 \in \mathbb{R}$, then for any $t > 0$, the list $\Lambda_t = \{\lambda_1 + t, \lambda_2 \pm t, \lambda_3, \ldots, \lambda_n\}$ is also the spectrum of a nonnegative matrix. In this paper it is shown that if $\lambda_1 > \lambda_2 \geq \ldots \geq \lambda_n \geq 0$, 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.

**AMS subject classifications.** 15A18.