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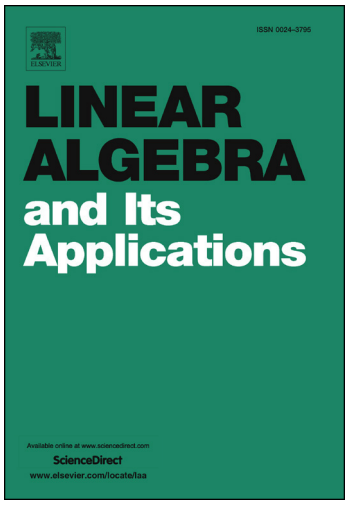

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On nonnegative matrices with prescribed eigenvalues and diagonal entries*

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Abstract

We consider the problem of the existence and construction of nonnegative matrices with prescribed spectrum and diagonal entries. Necessary and sufficient conditions have been obtained for $n \leq 3$, by Perfect and Fiedler, in the cases nonnegative and nonnegative symmetric, respectively. For $n \geq 4$, they obtained sufficient conditions. Many partial results about the problem have been published by several authors, mainly by Šmigoc. This is a long-standing unsolved inverse problem, but also necessary to apply a perturbation result, due to R. Rado, which has played an important role in the study of nonnegative inverse eigenvalue and inverse elementary divisors problems. Distinct versions of Rado's result have been also obtained for certain structured matrices. To apply Rado's result and its different versions we need to guarantee the existence of an $r \times r$, $r < n$, nonnegative (structured) matrix with prescribed spectrum and diagonal entries. This is an important motivation for this work. Here, we prove new sufficient conditions for $n \geq 4$, which extend and strictly contain the Perfect and Fiedler conditions. Our results generate an algorithmic procedure to construct a solution matrix.

AMS classification: 15A18.

Key words: Inverse eigenvalue problem; nonnegative matrices with prescribed diagonal entries.

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