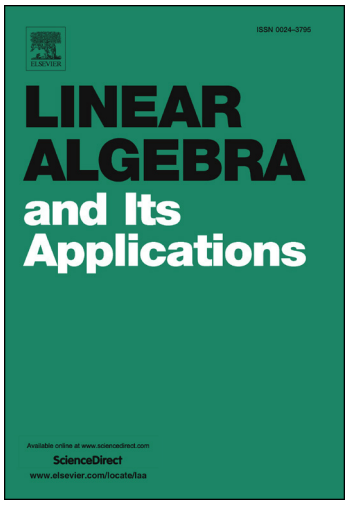

Bounds for the Perron root of nonnegative matrices and spectral radius of iteration matrices

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Bounds for the Perron Root of Nonnegative Matrices and Spectral Radius of Iteration Matrices[☆]

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Abstract

New bounds for the Perron root $\rho(A)$ of a nonnegative matrix A are proposed. We prove that

$$\min_{1\leq i\leq n}\frac{r_i(AB)}{r_i(B)}\leq\rho(A)\leq\max_{1\leq i\leq n}\frac{r_i(AB)}{r_i(B)}$$

where B is an arbitrary matrix with row sums $r_i(B)=\sum_k b_{ik}>0$, $i=1,...,n$. The bounds of H.Minc[1] and Shulin Liu [6] are both special cases of this result. And based on this result, we also get some bounds for the spectral radius of iteration matrices.

Keywords: Perron root; nonnegative matrix; lower bound; upper bound; iteration matrix
2000 MSC: 15A42; 15A18

1. Introduction

Let $A=[a_{ij}]$ be a nonnegative matrix of order n, the Perron root of A is a positive eigenvalue of A of maximum magnitude. It is also called the greatest characteristic root of A or the greatest latent root of A, we denote it as $\rho(A)$. We also denote $A\geq B$ if each entry of the matrix $A-B$ is nonnegative, and

$$r_i(A)=\sum_{k=1}^{n}a_{ik}, i=1,2,...,n.$$

In particular, we denote

$$r_{max}=r_{max}(r_i(A))=\max_i r_i(A),\quad r_{min}=r_{min}(r_i(A))=\min_i r_i(A).$$

For bounds of the Perron root, the following result is well known (see [1])

$$r_{min}\leq\rho(A)\leq r_{max}. \tag{1}$$

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