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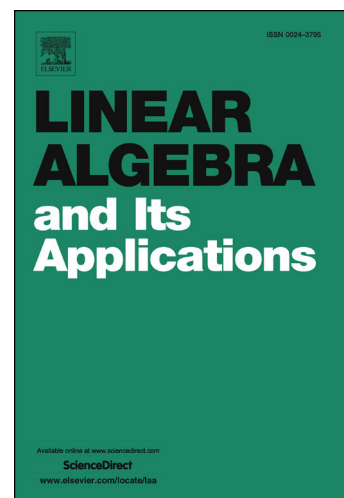
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Bounds for the Perron Root of Nonnegative Matrices and Spectral Radius of Iteration Matrices[☆]

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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 $r_i(B) = \sum_k b_{ik} > 0$, $i = 1, \dots, n$. 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

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

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])

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

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