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Some bounds for H-eigenpairs and Z-eigenpairs of a tensor

Wen Li[1], Weihui Liu[2], and Seak-Weng Vong[3]

Abstract

In this paper, we consider the H-eigenpairs and Z-eigenpairs of a tensor. By estimating the ratio of the smallest and largest entries in the Perron vector, we present some sharper bounds for the H-spectral radius of a nonnegative irreducible tensor. Similarly, we also obtain some Z-spectral radius bounds of an irreducible weakly symmetric tensor. In addition, by using the technique of matricizing, several bounds for the Z-spectrum are derived. These proposed bounds improve some existing ones, and some numerical examples are given to show the theoretical results.

Key words. H-eigenpair, Z-eigenpair, spectral radius, nonnegative irreducible tensor, weakly symmetric tensor.

1 Introduction

Many researchers have focused on the study of a tensor in recent years. For solving different problems, they proposed various definitions of eigenvalues of a tensor (e.g., see [24]). For instance, H-eigenvalues arising in information retrieval and data mining (e.g., see [17, 18, 19]), Z-eigenvalues arising in higher order Markov chains (e.g., see [4, 15]) and statistical data analysis (e.g., see [9, 10, 28]), etc. Hence a study of tensor eigenvalues is an important topic. Recently, many authors have presented some estimations on the tensor eigenvalues (e.g., see [7, 11, 12, 14, 16, 24, 26, 27]). The aim of this paper is to study the H-eigenpairs and Z-eigenpairs of nonnegative tensors. Specially, we are also interested in estimating the Z-spectral radius of a general tensor.

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