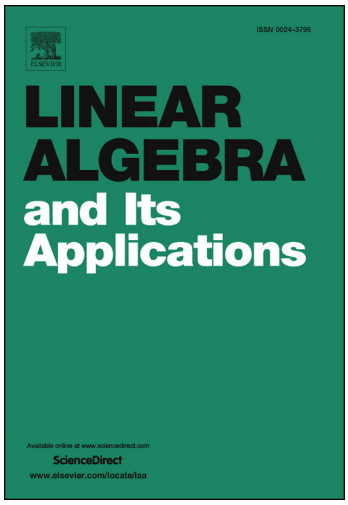

The spectra of uniform hypertrees

Wei Zhang, Liying Kang, Erfang Shan, Yanqin Bai

PII: S0024-3795(17)30438-X
DOI: http://dx.doi.org/10.1016/j.laa.2017.07.018
Reference: LAA 14264

To appear in: *Linear Algebra and its Applications*

Received date: 13 February 2017
Accepted date: 16 July 2017

Please cite this article in press as: W. Zhang et al., The spectra of uniform hypertrees, *Linear Algebra Appl.* (2017), http://dx.doi.org/10.1016/j.laa.2017.07.018

The spectra of uniform hypertrees*

Wei Zhang[1], Liying Kang[1], Erfang Shan[2]†, Yanqin Bai[1]

[1]Department of Mathematics, Shanghai University, Shanghai 200444, P.R. China

[2]School of Management, Shanghai University, Shanghai 200444, P.R. China

Abstract

In this paper we study the spectra of uniform hypertrees by using the generalized weighted incident matrix. We show that λ is a nonzero eigenvalue of the hypertree H corresponding to an eigenvector with all elements nonzero if and only if λ is a root of the polynomial $\varphi(H) = \sum_{i=0}^{m}(-1)^i|\mathcal{M}_i|x^{(m-i)r}$, where $|\mathcal{M}_i|$ is the number of matchings of order i in H.

Keywords: Uniform hypergraph; Spectrum; Matching; Hypertree; Adjacency tensor; Characteristic polynomial

AMS subject classification: 05C50, 05C65, 05C35

1 Introduction

The spectrum plays an important role in the study of graph theory. A lot of results have been developed on the relation between the structural parameters of a graph and the spectrum, especially the spectral radius. For example, Bollobás and Nikiforov [1] gave some relations on the spectral radius and the number of cliques. Yuan [16] showed that the genus of a graph is related to the spectral radius. Based on the results, we can either bound the spectral radius by the structural parameters and find the extremal graphs with a certain property, or obtain an approximation of the structural parameters through the spectral radius.

In 1972, Mowshowitz [9] found that for a directed graph, the coefficients of the characteristic polynomial are related to the collection of disjoint cycles. Specifically, the characteristic polynomial $\phi(T)$ of a tree T can be represented by counting of matchings:

*Research was partially supported by the National Nature Science Foundation of China (Nos. 11571222, 11471210, 11371242)

†*Corresponding authors. E-mail address: garfunkel@shu.edu.cn (W. Zhang), lykang@shu.edu.cn (L. Kang), efshan@shu.edu.cn (E. Shan)*