

# Accepted Manuscript

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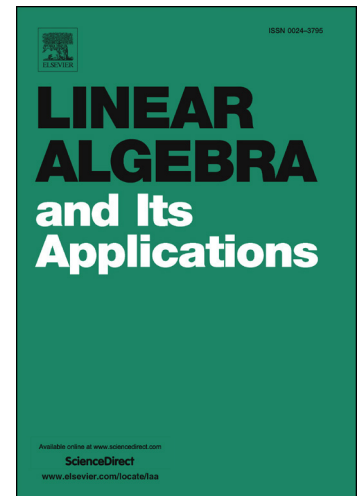
PII: S0024-3795(17)30438-X  
DOI: <http://dx.doi.org/10.1016/j.laa.2017.07.018>  
Reference: LAA 14264

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>

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# The spectra of uniform hypertrees\*

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## Abstract

In this paper we study the spectra of uniform hypertrees by using the generalized weighted incident matrix. We show that  $\lambda$  is a nonzero eigenvalue of the hypertree  $H$  corresponding to an eigenvector with all elements nonzero if and only if  $\lambda$  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:

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

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