

Accepted Manuscript

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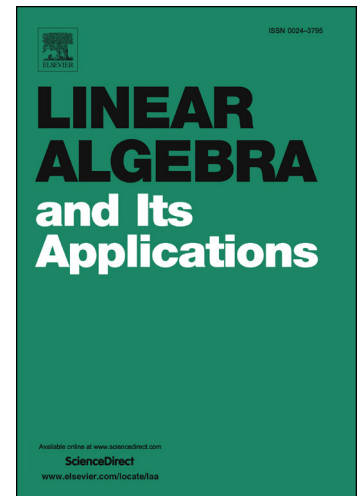
PII: S0024-3795(18)30075-2
DOI: <https://doi.org/10.1016/j.laa.2018.02.014>
Reference: LAA 14479

To appear in: *Linear Algebra and its Applications*

Received date: 24 May 2017
Accepted date: 12 February 2018

Please cite this article in press as: X. Liu, S. Liu, On the A_α -characteristic polynomial of a graph, *Linear Algebra Appl.* (2018), <https://doi.org/10.1016/j.laa.2018.02.014>

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On the A_α -characteristic polynomial of a graph

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Abstract

Let G be a graph with n vertices, and let $A(G)$ and $D(G)$ denote respectively the adjacency matrix and the degree matrix of G . Define

$$A_\alpha(G) = \alpha D(G) + (1 - \alpha)A(G)$$

for any real $\alpha \in [0, 1]$. The A_α -characteristic polynomial of G is defined to be

$$\det(xI_n - A_\alpha(G)) = \sum_j c_{\alpha j}(G)x^{n-j},$$

where $\det(*)$ denotes the determinant of $*$, and I_n is the identity matrix of size n . The A_α -spectrum of G consists of all roots of the A_α -characteristic polynomial of G . A graph G is said to be *determined by its A_α -spectrum* if all graphs having the same A_α -spectrum as G are isomorphic to G .

In this paper, we first formulate the first four coefficients $c_{\alpha 0}(G)$, $c_{\alpha 1}(G)$, $c_{\alpha 2}(G)$ and $c_{\alpha 3}(G)$ of the A_α -characteristic polynomial of G . And then, we observe that A_α -spectra are much efficient for us to distinguish graphs, by enumerating the A_α -characteristic polynomials for all graphs on at most 10 vertices. To verify this observation, we characterize some graphs determined by their A_α -spectra.

Keywords: Adjacency matrix; Degree matrix; A_α -characteristic polynomial; A_α -spectrum; Determined by its A_α -spectrum

AMS Subject Classification (2010): 05C50

1 Introduction

Let $G = (V(G), E(G))$ be a graph with the vertex set $V(G) = \{v_1, v_2, \dots, v_n\}$ and the edge set $E(G) = \{e_1, e_2, \dots, e_m\}$. The *adjacency matrix* of G , denoted by $A(G) = (a_{ij})_{n \times n}$, is an

*Supported by the National Natural Science Foundation of China (Nos. 11361033 and 11601431), the China Postdoctoral Science Foundation (No. 2016M600813) and the Scientific Research Foundation of NPU (No. 3102016OQD029).

†Supported by the National Natural Science Foundation of China (Nos. 11501050 and 11401044) and the Natural Science Basic Research Plan in Shaanxi Province of China (No. 2016JM6081).

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