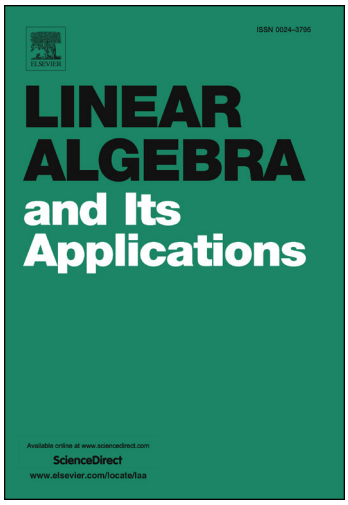

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On the A_α-characteristic polynomial of a graph

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

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