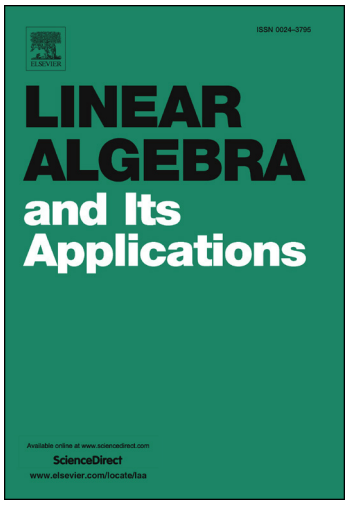

Distance between the normalized Laplacian spectra of two graphs

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Distance between the normalized Laplacian spectra of two graphs

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Abstract

Let $G = (V, E)$ be a simple graph of order n. The normalized Laplacian eigenvalues of graph G are denoted by $\rho_1(G) \geq \rho_2(G) \geq \cdots \geq \rho_{n-1}(G) \geq \rho_n(G) = 0$. Also let G and G' be two nonisomorphic graphs on n vertices. Define the distance between the normalized Laplacian spectra of G and G' as

$$\sigma_N(G, G') = \sum_{i=1}^{n} |\rho_i(G) - \rho_i(G')|^p, \ p \geq 1.$$

Define the cospectrality of G by

$$cs^N(G) = \min\{\sigma_N(G, G') : G' \text{ not isomorphic to } G\}.$$

Let

$$cs_n^N = \max\{cs^N(G) : G \text{ a graph on } n \text{ vertices}\}.$$

In this paper, we give an upper bound on $cs^N(G)$ in terms of the graph parameters. Moreover, we obtain an exact value of cs_n^N. An upper bound on the distance between the normalized Laplacian spectra of two graphs has been presented in terms of Randić energy. As an application, we determine the class of graphs, which are lying closer to the complete bipartite graph than to the complete graph regarding the distance of normalized Laplacian spectra.

AMS classification: 05C50, 15A18

Keywords: Normalized Laplaican matrix of a graph, Normalized Laplacian eigenvalues, Spectral distance, Cospectrality, Randić energy

1 Introduction

Let $G = (V, E)$ be a simple graph with vertex set $V(G) = \{v_1, v_2, \ldots, v_n\}$ and edge set $E(G)$. Also let d_i denote the degree of a vertex $v_i \in V(G)$, $i = 1, 2, \ldots, n$. The maximum vertex degree is denoted by Δ, the second maximum by Δ_2 and the minimum by δ. Let $N_G(v_i)$ be the neighbor set of the vertex $v_i \in V(G)$. If the vertices v_i and v_j are adjacent, we write $v_iv_j \in E(G)$. The