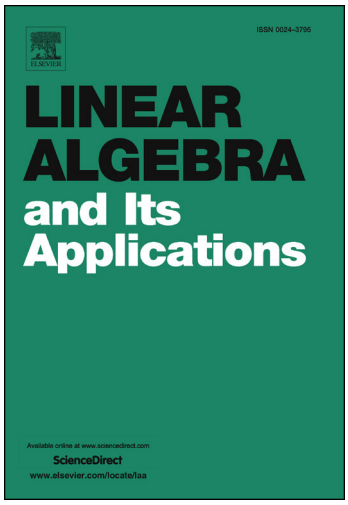

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Distance Energy Change of Complete Bipartite Graph Due to Edge Deletion

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Abstract

The distance matrix, distance eigenvalue, and distance energy of a connected graph have been studied intensively in the literature. We propose a new problem of studying how the distance energy changes when an edge is deleted. In this paper, we prove that the distance energy of a complete bipartite graph is always increased when an edge is deleted.

Keywords: Distance matrix, Distance eigenvalue, Distance energy, Distance energy change, Edge deletion.

2010 MSC: 05C50

1. Introduction

Let G be a connected graph of order $n \geq 1$ with vertex set $\{v_1, v_2, \ldots, v_n\}$. The distance matrix of G is the $n \times n$ matrix $D(G) = [d_{ij}]$, where d_{ij} is the distance between the vertices v_i and v_j. The eigenvalues $\{\lambda_1, \ldots, \lambda_n\}$ of $D(G)$ are called the distance eigenvalues of G, and they are all real because $D(G)$ is a real symmetric matrix. The distance energy of G is defined by

$$E_D(G) = \sum_{i=1}^{n} |\lambda_i|.$$

Since $D(G)$ has zero diagonal entries, $\lambda_1 + \cdots + \lambda_n = tr(D(G)) = 0$. Hence

$$E_D(G) = 2\sum_{\lambda_i > 0} \lambda_i = -2\sum_{\lambda_i < 0} \lambda_i$$

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