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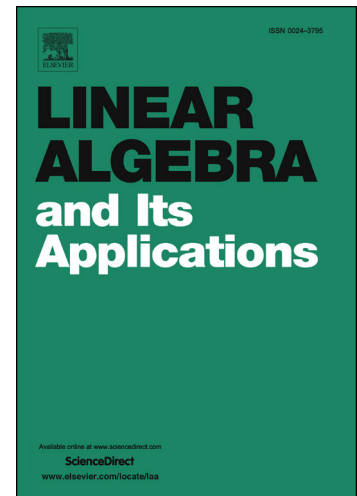
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The Algebraic Connectivity of a Graph and its Complement

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Abstract

For a graph G , let $\lambda_2(G)$ denote its second smallest Laplacian eigenvalue. It was conjectured that $\lambda_2(G) + \lambda_2(\overline{G}) \geq 1$, where \overline{G} is the complement of G . In this paper, it is shown that $\max\{\lambda_2(G), \lambda_2(\overline{G})\} \geq \frac{2}{5}$.

AMS Classification: 05C50

Keywords: Laplacian eigenvalues of graphs, Laplacian spread

1 Introduction

All graphs considered in this paper are simple (no loops and no multiple edges). If G is a graph and $v \in V(G)$, we denote by $N_G(v)$ the set of vertices adjacent to v . We denote the complementary graph of G by \overline{G} .

The adjacency matrix $A(G)$ of G is the matrix whose (u, v) -entry is equal to 1 if $uv \in E(G)$ and 0 otherwise. If $D(G)$ denotes the diagonal matrix of vertex degrees, then the Laplacian of the graph G is defined as $L(G) = D(G) - A(G)$. We denote the Laplacian eigenvalues of G by

$$0 = \lambda_1(G) \leq \lambda_2(G) \leq \dots \leq \lambda_n(G).$$

The second smallest eigenvalue $\lambda_2(G)$ is also called the *algebraic connectivity* of G and is an important indicator related to various properties of the graph. It is well-known that

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