

Inverse Fiedler vector problem of a graph.

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A Fiedler vector is an eigenvector of a weighted Laplacian matrix with respect to its second smallest eigenvalue. Fiedler vectors have been widely used in graph partitioning, graph drawing, spectral clustering, and identifying characteristic sets. We study how graph structure influences the possible Fiedler vectors associated with different weighted Laplacian matrices. For a given tree, we characterize all possible Fiedler vectors of its weighted Laplacian matrices. We also extend this result to discrete Schrödinger operators. As an application, the characteristic set may consist of any vertex or the endpoints of any edge of the tree, except for a leaf.