

Partition of a graph using the Fiedler's theory: some properties

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According to the Fiedler's theory, a bipartition of a graph can be obtained by means of the second eigenvector of its Laplacian matrix. A possible refinement of this method holds true by considering a weighted Laplacian matrix. However in order to have a robust partition of a given graph, it is necessary to consider the effect of a perturbation on a weighted Laplacian matrix. In particular, we show that different partitions of a graph are obtained by specifying the size of its parts or by requiring which nodes are in a section of the partition rather than into another one.

Furthermore, by requiring the coalescence between the second and the third eigenvalues of the perturbed Laplacian, a suitable robustness measure of the Fiedler partition can be defined and we study the network partition determined by the two eigenvectors near the eigenvalue collapse.

Some applications of this method to small graphs are investigated.

Further applications of the method so far put forward can be addressed to biological systems.

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