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Spectral clustering for directed graphs

Graphs and Markov chains can be represented by matrixes. One of the most common representations is the Laplacian matrix. This presentation summarises the spectral clustering of undirected graphs. Then we consider a basic approach to spectral clustering of directed graphs by the symmetric graph. Then we show a new approach to the Laplacian matrix for directed graphs using incidence matrix M for a directed graph. We define the new Laplacian matrix for directed graphs as $1/2M * M$. We show examples of some graphs, where new spectral clustering of the Laplacian matrix for directed graphs shows better results than the traditional approach by symmetric graph. Everything concludes in the form of showing that the new Laplacian matrix for directed graphs has the same fundamental properties as a normal Laplacian matrix i. e. matrix is singular, symmetric, weakly diagonally dominant, positive semi-definite, zero is an eigenvalue and vector of ones is an eigenvector. A graph is continuous if and only if the algebraic multiplicity of 0 is one and the algebraic multiplicity of 0 is equal to a number of continuous components.

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