Complex Adjacency Spectra of (Multi)Digraphs

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Abstract

Given any graph, we can uniquely associate a square matrix which stores informations about its vertices and how they are interconnected. The goal of spectral graph theory is to see how the eigenvalues and eigenvectors of such a matrix representation of a graph are related to the graph structure. In literature, there are a wide variety of matrices associated to a graph, such as the adjacency matrix, the Laplacian matrix, the normalized Laplacian matrix, etc. We consider here (multi)digraphs and their associated matrices only. Also, we define a new matrix representation for a multidigraph and named it as the complex adjacency matrix. Next, we establish some of the spectral properties of a (multi)digraph with respect to its complex adjacency matrix.