

Modular Decompositions and Coherent Network Partitions

Angela Angeleska*, The University of Tampa, Tampa, FL, USA

Zoran Nikoloski, University of Potsdam and Max Planck Institute of Molecular Plant Physiology, Potsdam, Germany.

The recently introduced coherent partition of a graph G is defined as a vertex partition that yields partition composed only of disconnected subgraphs in the complement of G . An optimal coherent partition is defined as a coherent partition induced by an edge cut with the smallest number of edges. Here we characterize some relations between coherent and other types of partitions, including: clique partitions, biclique partitions, and modular graph decompositions. We show that an optimal coherent partition in a graph G corresponds to a biclique partition in the weighted quotient graph G/M , where M is the maximal modular partition of G . As a consequence, the problem of finding optimal coherent partition in graphs reduces to a problem of finding optimal coherent partition in prime graphs. In addition, we demonstrate that a coherent partition in G can be viewed as a clique partition of the graph G' , obtained from G by connecting pair of vertices at distance 2 which are P_4 endpoints. This allows us to determine classes of graph on which the NP-hard problem of determining optimal coherent partitions can be solved in polynomial time.

Keywords: network partitions, biclique spanned subgraphs, coherent partition, modular decomposition