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Parameters of quotient-polynomial graphs

It is well-known that the parameters of a distance-regular graph (DRG) are determined by its intersection array. The intersection array is a minimal collection of intersection numbers that completely determines the intersection matrices of the association scheme determined by the DRG, and the adjacency algebra of this scheme is naturally polynomial in the adjacency matrix A_1 of the DRG.

It has been observed that many other symmetric association schemes are "polynomial" in the sense that their adjacency algebra is generated by the adjacency matrix of one of the graphs in the scheme. In a 2016 paper, Miguel Fiol referred to these graphs as quotient-polynomial graphs (QPGs). In 2023, a result of Xia, Tan, Liang, and Koolen showed that Q-polynomial association schemes are generated by the adjacency matrix of a QPG.

Earlier this year, Roghayeh Maleki and I released a database of parameters of QPGs whose association schemes are polynomial in A_1, where A_1 is the adjacency matrix of the QPG. We show each such QPG determines an equivalence class of QPG-parameter arrays, and the intersection matrices of the corresponding association scheme are determined by the QPG-parameter array.

In this talk I will explain how to work with QPG-parameter arrays, the techniques used to generate this database, and discuss the feasibility and realizability tests we have developed for QPG-parameter arrays. This is joint work with Roghayeh Maleki.