

Abstract

**Unit gain graphs with two distinct eigenvalues
and systems of lines in complex space**

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Since the introduction of the Hermitian adjacency matrix for digraphs, interest in so-called complex unit gain graphs has surged. In this talk, we consider gain graphs with two distinct eigenvalues. Analogously to graphs with few distinct eigenvalues, a great deal of structural symmetry is required. This allows us to draw a parallel to well-studied systems of lines in complex space, through a natural correspondence to unit-norm tight frames. Examples are drawn from various relevant concepts related to lines in complex space with few angles, including SIC-POVMs and MUBs. Other examples relate to the hexacode, Coxeter-Todd lattice, and the Van Lint-Schrijver association scheme. Many other examples can be obtained as induced subgraphs by employing a technique parallel to the dismantling of association schemes. Specific examples thus arise from (partial) spreads in some small generalized quadrangles. Finally, we offer a full classification of two-eigenvalue gain graphs with degree at most 4, or with multiplicity at most 3.

Joint work with Pepijn Wissing