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Bianalytic mappings between free LMI domains

Abstract

(Joint work with Meric Augat, Bill Helton and Igor Klep). Given a g-tuple A of $d\times d$ matrices, the set $\overline{\mathbb{D}}_A(1)$ of those $x \in \mathbb{C}^g$ such that $I - \sum_{j=1}^g A_j x_j - \sum_{j=1}^g A_j^* x_j^*$ is positive semidefinite is an LMI domain. LMI domains find numerous applications. They are fundamental objects in semidefinite programming. Let $\overline{\mathbb{D}}_A(n)$ denote the set of g-tuples of $n \times n$ matrices X such that $I - \sum_{j=1}^g A_j \otimes X_j - \sum_{j=1}^g A_j^* \otimes X_j^*$ is positive semidefinite. The sequence $(\overline{\mathbb{D}}_A(n))$ is a free LMI domain. Free LMI domains arise naturally in a number of contexts, including engineering systems theory and in the theory of operator systems. They are the simplest examples of matrix convex sets.

This talk will report on progress on classifying triples (A, B, p) where A and B are g-tuples of matrices and p is a free bianalytic mapping between the free LMI domains determined by A and B. Under irreducibility inspired hypotheses on A and B, the map p takes a special form described by a g-tuple of $g \times g$ matrices Ξ that span an algebra for which Ξ is its own multiplication table and $B = VAU$ for unitaries V and U. Moreover, for each such p, there exists a family of pairs (A, B), roughly parameterized by the $g \times g$ unitary matrices, such that p is a bianalytic map between the free LMI domains determined by A and B.

Talk time: 07/18/2016 6:00PM— 07/18/2016 6:20PM
Talk location: Crow 206

Special Session: Multivariable operator theory. Organized by H. Woerdeman.