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Regular and positive noncommutative rational functions

Abstract

Call a noncommutative rational function r regular if it has no singularities, i.e., $r(X)$ is defined for all tuples of self-adjoint matrices X. In this talk regular noncommutative rational functions r will be characterized via the properties of their (minimal size) linear systems realizations $r = c^*L^{-1}b$. Our main result states that r is regular if and only if $L = A_0 + \sum_j A_j x_j$ is privileged. Roughly speaking, a linear pencil L is privileged if, after a finite sequence of basis changes and restrictions, the real part of A_0 is positive definite and the other A_j are skew-adjoint. Afterwards I will speak about a solution to a noncommutative version of Hilbert's 17th problem: a positive regular noncommutative rational function is a sum of squares.

The talk is based on the joint work with I. Klep and J. E. Pascoe.

Talk time: 07/21/2016 3:30PM— 07/21/2016 3:50PM
Talk location: Crow 206

Special Session: Non-commutative inequalities. Organized by J.W. Helton and I. Klep.