

Jurij Volcic

The University of Auckland

Free loci of matrix pencils and domains of noncommutative rational functions

Abstract

Consider a monic linear pencil $L(x) = I - A_1x_1 - \dots - A_gx_g$ whose coefficients A_j are $d \times d$ matrices. It is naturally evaluated at g -tuples of matrices X using the Kronecker tensor product, which gives rise to its free locus $Z(L) = \{X : \det L(X) = 0\}$. Our main result is the following: $Z(L) \subseteq Z(L')$ if and only if the natural map sending the coefficients of L' to the coefficients of L induces a homomorphism $A'/\text{rad } A' \rightarrow A/\text{rad } A$. Since linear pencils are a key ingredient in studying noncommutative rational functions via linear systems realization theory, the above result leads to a characterization of all noncommutative rational functions with a given domain. Finally, an answer to a quantum version of Kippenhahn's conjecture on linear pencils will be given: if hermitian matrices A_1, \dots, A_g generate $M_d(\mathbb{C})$ as an algebra, then there exist hermitian matrices X_1, \dots, X_g such that $\sum_i A_i \otimes X_i$ has a simple eigenvalue.

The talk is based on the joint work with I. Klep.

Talk time: 07/19/2016 3:30PM— 07/19/2016 3:50PM

Talk location: Cupples I Room 113

Special Session: State space methods in operator and function theory. Organized by J. Ball and S. ter Horst.