Algebraic Combinatorics meets Inverse Systems
January 19-21, 2007

Pairs of commuting nilpotent matrices and Hilbert functions

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Abstract

We discuss the Hilbert functions that occur for pairs (A, B) of commuting nilpotent $n \times n$ matrices, and a connection with the varieties $Z(T)$ parametrizing ideals I in $R = k[x, y]$ of Hilbert function $H(R/I) = T$. We denote by NC(P) the nilpotent commutator of a Jordan matrix A_P whose Jordan form is given by the partition P. We discuss an application of results of J. Yameogo and the author concerning $Z(T)$. We show that a generic element B_P of NC(P), has partition $Q(P)$ with decreasing parts, and that the problem of determining $QI(P)$ is equivalent to that of determining the minimim Hilbert function associated to (A_P, B), B in NC(P). We also describe further results about the map P to $Q(P)$.

Joint work with Roberta Basili.