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Finite dimensional contractive realizations of rational Schur–Agler functions

Abstract

It is well known that a contractive rational matrix-valued function admits a finite dimensional contractive realization. There are various proofs of this basic result, but most of them use in an essential way the uniqueness of a minimal realization hence cannot generalize to the multivariable setting. I will prove that a rational matrix-valued function that is regular on a product of closed matrix balls (or much more generally of polynomially defined domains whose defining matrix polynomials satisfy an Archimedean condition) and whose corresponding Agler norm is strictly less than 1 admits a finite dimensional contractive realization. The proof proceeds by applying a matrix-valued version of a Hermitian Positivstellensatz originally due to Putinar to obtain a Hermitian sum of squares decomposition, and then using a variation of the usual lurking isometry argument, that we call a lurking contraction argument, to produce a contractive realization. This is a joint work with D. Kalyuzhnyi-Verbovetskyi, A. Grinshpun, and H. Woerdeman.

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