

Complex expansion points and the PCC-Krylov subspace for projection-based model reduction

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Abstract

Krylov subspace projection methods have been used for several years for dimension reduction of large-scale models of input-output behavior determined by a certain dynamical system. In general they involve forming a Taylor approximation about an expansion point located somewhere on the complex plane, but whose ideal location is unknown. Due to the increased computation and storage required to perform arithmetic with complex matrices, the use of complex expansion points has been of theoretical interest but not used much in practice.

I will introduce a new variant of the standard Krylov subspace, called the Paired Conjugate (PCC)-Krylov subspace, which is inevitable if we are to consider general complex expansion points. I will also introduce the seemingly unrelated notion of equivalent-real arithmetic for complex matrices and explain how it provides the key to making the use of these subspaces feasible for industrial use.

This talk should be accessible to anyone with some background in complex arithmetic and linear algebra, and knows what a Taylor series approximation is.