Inversion of Mosaic Hankel Matrices via Matrix Polynomial Systems

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Abstract

Heinig and Tewodros give a set of components whose existence provides a necessary and sufficient condition for a mosaic Hankel matrix to be nonsingular. When this is the case they also give a formula for the inverse in terms of these components.

By converting these components into a matrix polynomial form we show that the invertibility conditions can be described in terms of matrix rational approximants for a matrix power series determined from the entries of the mosaic matrix. In special cases these matrix rational approximations are closely related to Padé and various well-known matrix-type Padé approximants. We also show that the inversion components can be described in terms of unimodular matrix polynomials. These are shown to be closely related to the V and W matrices of Antoulas used in his study of recursiveness in linear systems. Finally, we present a recursion which allows for the efficient computation of the inversion components of all nonsingular "principal mosaic Hankel" submatrices (including the components for the matrix itself).