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On Block Vandermonde Matrix Constructed from Matrix Polynomial Solvents

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Abstract : In control engineering, systems described by matrix fractions are studied through properties of block roots, also called solvents. These solvents are usually dealt with in a block Vandermonde matrix form. Inverses and determinants of Vandermonde matrices and block Vandermonde matrices are used in solving problems of numerical analysis in many domains but require costly computations. Even though Vandermonde matrices are well known and method to compute inverse and determinants are many and, generally, based on interpolation techniques, methods to compute the inverse and determinant of a block Vandermonde matrix have not been well studied. In this paper, some properties of these matrices and iterative algorithms to compute the determinant and the inverse of a block Vandermonde matrix are given. These methods are deducted from the partitioned matrix inversion and determinant computing methods. Due to their great size, parallelization may be a solution to reduce the computations cost, so a parallelization of these algorithms is proposed and validated by a comparison using algorithmic complexity.

Keywords : block vandermonde matrix, solvents, matrix polynomial, matrix inverse, matrix determinant, parallelization
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