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14. Mathematical Aspects of Computer Science

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Multivariate polynomial equations and duality

In this presentation, we are interested in the use of duality in effective computations on polynomials. Its links with the theory of inverse systems is described and an application to the construction of the local ring of an isolated point is given. Its correlation with structured matrices and some natural extensions to the multivariate case are discussed. Multivariate Toeplitz, Hankel, and Van der Monde matrices, Bezoutians, algebraic residues and relations between them are analyzed and some applications to root finding problems for a system of multivariate polynomial equations, where these matrices play an important role, are given. We show how this techniques enable us to obtain a better insight into the major problems of multivariate polynomial computations and to improve substantially some known algorithms.