THE NEAREST MULTIVARIATE SYSTEM WITH GIVEN ROOT STRUCTURE

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Let $f_1, \ldots, f_s$ be polynomials in the variables $x_1, \ldots, x_n$ with finitely many common roots. Assume that either

(a) $f_1, \ldots, f_s$ is an over-constrained system (more equation than variables) which has k common roots,

or

(b) $f_1, \ldots, f_s$ has roots with multiplicities, which can be described by the vanishing of certain derivatives of $f_1, \ldots, f_s$ in the roots

However, even small perturbation of the coefficients can destroy completely the above root structures. This is the reason that in numerical computations handling the above systems is a major challenge: convergence to the solution is slow and the output is unreliable, or no output is returned.

In this talk we propose iterative methods, which for a given (perturbed) system $F_1, \ldots, F_s$ and given root structure, computes the nearest system $f_1, \ldots, f_s$ which has roots with the given structure. The method also computes the common roots of $f_1, \ldots, f_s$ simultaneously.

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