Computing Multiple Zeros of Polynomial Systems

Lihong Zhi - Academy of Mathematics and Systems Science, CAS

Given a polynomial system f with a multiple zero x whose Jacobian matrix at x has corank one, we show how to compute the multiplicity structure of x and the lower bound on the minimal distance between x and other zeros of f.If x is only given with limited accuracy, we give a numerical criterion for isolating a nearby cluster of μ zeros of f (counting multiplicities) in a ball around x. Moreover, we also show how to compute verified and narrow error bounds such that a slightly perturbed system is guaranteed to possess an isolated corank one singular solution within computed error bounds. Finally, we present modified Newton iterations which converge quadratically if x is close to an isolated exact singular solution of f. This is joint work with Zhiwei Hao, Wenrong Jiang, Nan Li.