Symbolic representation of polynomial systems for efficient manipulation and evaluation

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Abstract

I, with Andrew Sommese (University of Notre Dame) and Charles Wampler (GM Research & Development), with some early work of Chris Monico (Texas Tech University), have been developing a new software package, Bertini, to numerically compute the zero- and positive-dimensional solutions of polynomial systems using a number of recent techniques as well as adaptive precision.

A fundamental design issue when planning Bertini was the internal representation of polynomial systems. We chose to use straight-line programs since they allow for very efficient evaluation, simple automatic differentiation, and polynomials in nonstandard forms. In this talk, I will discuss how Bertini parses polynomials systems into straight-line programs as well as how multi-homogenization and differentiation may be carried out automatically.