

Meeting: 1001, Evanston, Illinois, SS 9A, Special Session on Solving Polynomial Systems

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(charles.w.wampler@gm.com), General Motors R&D Center, MC 480-106-359, 30500 Mound Road, Warren, MI 48090-9055. *Solving Polynomial Systems by Intersecting Subsystems Using Diagonal Homotopies*. Preliminary report.

A diagonal homotopy can compute the witness set for the intersection of two irreducible algebraic sets. This capability can be employed to compute the solution of a system of polynomial equations by intersecting the varieties defined by subsets of the equations. To intersect two such subsystems, one must apply the diagonal homotopy pairwise to the irreducible components of the solutions of the subsystems, followed by membership tests to eliminate duplications. We describe how to organize this in general and then specialize to the case where one of the subsystems is a hypersurface, given by a single equation. A natural consequence is that one may find all isolated solutions of a polynomial system by introducing the equations one-by-one, carrying forward only the components of appropriate dimension for the next stage of computation. Experiments with highly structured polynomial systems show that this approach is very effective, capturing, for example, much of the sparsity of the equations without analyzing their monomial structure. This holds much promise for the efficient treatment of systems arising in applications, in which the equations may have intricate structures not easily exploited by previous techniques. (Received August 17, 2004)