

1067-14-2189

Sharon Elizabeth Hutton* (sehutton@ncsu.edu), North Carolina State University, Mathematics Department, Box 8205, Raleigh, NC 27695, and **Erich L. Kaltofen** (kaltofen@ncsu.edu) and **Lihong Zhi** (lzhi@mmrc.iss.ac.cn). *Exact Sums-of-Squares Certificates in Numeric Algebraic Geometry*.

We consider the problem of finding the nearest polynomial/system with a constrained root. Our distance measure to the nearest polynomial/system is the weighted Euclidean, one, or infinity coefficient norm. Although much work has already been done on this problem, we offer a new proof using parameterized Lagrangian multipliers, which allows for linear equality and inequality constraints on the coefficients via Karush-Kuhn-Tucker conditions. We also discuss exact sums-of-squares certificates for a lower bound of the distance to the nearest polynomial/system. Some polynomials that cannot be written as a sum-of-squares, such as a modified Motzkin polynomial, have a positive distance to the nearest polynomial with a real root and a sums-of-squares certificate for a positive lower bound. These sums-of-squares certificates offer an alternative proof that a polynomial has no real root and a deformation analysis for Seidenberg's problem.

These results are part of my Ph.D. thesis and joint work with Erich L. Kaltofen and Lihong Zhi. (Received September 22, 2010)