1117-14-538   **Tulay Ayyildiz Akoglu***, Department of Mathematics, Box 8205, NC State University, Raleigh, NC 27695. *Certifying Solutions of Polynomial Systems.*

The first part of this work is concerned with certifying that a given point is near an exact root of an overdetermined polynomial system with rational coefficients. Our certification is based on hybrid symbolic-numeric methods to compute an exact *rational univariate representation* (RUR) of a component of the input system from approximate roots. The accuracy of the RUR is increased via Newton iterations until the exact RUR is found, which we certify using exact arithmetic. Since the RUR is well-constrained, we can use it to certify the given approximate roots using α-theory. The second part focuses on certifying isolated singular roots of well-constrained polynomial systems with rational coefficients. We use a determinantal form of the *isosingular deflation*. The resulting polynomial system is overdetermined, but the roots are now simple, thereby reducing the problem to the overdetermined case. In the third part, we describe how to use the Hermite matrices to certify the real roots of polynomial systems with given approximate roots. (Received January 19, 2016)