1125-15-2428 **Tulay Ayyildiz Akoglu*** (tayyild@ncsu.edu), 2311 Stinson Drive, Raleigh, NC 27695.

Constructing exact Hermite matrices using approximate roots. Preliminary report.

Let $\mathbf{f} = (f_1, \ldots, f_N)$ be a system of multivariate polynomials in over rationals with common roots $\xi_1, \xi_2, \ldots, \xi_k$ and assume that $I =< f_1, \ldots, f_N >$ is a zero dimensional ideal. Hermite matrix of $\mathbf{f}$ with respect to an auxiliary polynomial g is defined by

$$H_g(\mathbf{f}) := V^T D_g V$$

where V is a Vandermonde matrix and D_g is a diagonal matrix such that $[D_g]_{ii} = g(\xi_i)$. The signature of Hermite matrices gives important information on the signs of the polynomial g on the common real roots of $\mathbf{f}$.

Now assume that we are only given approximate roots of $\mathbf{f}$ and want to find the exact Hermite matrix with respect to g. First, we compute an approximate Hermit matrix $H_g(\mathbf{f})$ using given approximate roots of $\mathbf{f}$ and a Vandermonde matrix. Second, we rationalize each entry of the approximate Hermite matrix using rational number reconstruction (via continued fractions) with a preset bound on the denominators. Then we describe a certification procedure to decide whether the rationalized Hermite matrix is the exact one. (Received September 20, 2016)