1108-65-444 **Jan Verschelde** and **Xiangcheng Yu*** (xyu30@uic.edu), Dept. of Math., Stats., and Computer Science, University of Illinois at Chicago, 851 S. Morgan St. (m/c 249), Chicago, IL 60607.
Accelerating Polynomial Homotopy Continuation on a Graphics Processing Unit. Preliminary report.

Numerical continuation methods apply predictor-corrector algorithms to track a solution path defined by a family of systems. The systems we consider are defined by polynomials in several variables. For larger dimensions and degrees, the numerical conditioning worsens and double precision becomes often insufficient. With double double and quad double arithmetic, larger problems can be solved accurately, but at a higher computational cost. This cost overhead can be compensated by acceleration on a Graphics Processing Unit (GPU).

We describe our implementation and report on computational results on two benchmark polynomial systems. The first benchmark consists of two sequences of Pieri homotopies. In the second benchmark, we applied monodromy to the cyclic n-roots problems. In case the linear algebra dominates the total computational cost of a path tracker, the dimension needs to be of the order of at least several hundreds. For general polynomials of higher degrees, already in smaller dimensions, acceleration may offset the cost of higher precision arithmetic. (Received January 19, 2015)