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Frank Sottile* (sottile@math.tamu.edu), Department of Mathematics, Texas A&M University, TAMU-3368, College Station, TX 77843, and **Jonathan D Hauenstein**. *alphaCertified: Software for certifying solutions to polynomial systems.*

Smale's α -theory provides computable certificates that, for a square system of polynomial equations, Newton iterations beginning at a given point will converge quadratically, doubling the precision at each step, to a solution to the system. In theory, this may be used to certify the output of a numerical solver, including certifying that all solutions have been found, that two numerically computed solutions are distinct, and that a numerically computed solution is real.

alphaCertified is a stand-alone software package with a MAPLE interface that uses α -theory to compute certificates for solutions to systems of polynomial equations.

This talk will briefly recall the main points of Smale's α -theory, and describe the functionality of alphaCertified. It will also include some examples of the application of these algorithms to questions that arise in our research, for alphaCertified was written as a tool for our work. (Received September 09, 2010)