

Department of Mathematics
North Carolina State University
Distinguished Faculty Colloquium

Tim Kelley

Drexel Professor of Mathematics
North Carolina State University



Thursday, March 15, 2012 at 4 p.m. in SAS 1102

Tea in SAS 4104 at 3:30 p.m.

Pseudo-Transient Continuation

The convergence theory for Newton's method says that either the iteration will converge rapidly to a solution from a given initial iterate, or fail in one of two easy-to-detect ways. The failure modes include (1) convergence to an incorrect (i.e., non-physical or dynamically unstable) solution, (2) divergence to infinity, and (3) stagnation at a singularity of the Jacobian. The classic theory will count (1) as a success, but shouldn't.

Pseudo-transient continuation is a way to enforce dynamic stability of the solution of a nonlinear equation and thereby increase the chances that the limit of the Newton iteration is a useful solution. This approach can also help one avoid stagnation. In this talk we will describe the method and some of the recent convergence results. We will also discuss some of the many applications, and show how nonsmooth analysis can connect theory and practice.

Five of my PhD students, one postdoc, and three colleagues from MAE were involved in this project.

This presentation should be understandable to anyone who is good at calculus.

The Distinguished Faculty Colloquium series recognizes Mathematics Department faculty who have been named fellows of scientific, engineering, and mathematical societies. Professor Kelley is a Fellow of the Society for Industrial and Applied Mathematics.