Pseudo-Smooth Functions and Newton-Type Methods for Nonlinear Optimization and Complementarity Problems

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A *pseudo-smooth* function $f : \mathbb{R}^n \to \mathbb{R}^m$ is a locally Lipschitz function being continuously differentiable on an open and dense subset $\Omega \subset \mathbb{R}^n$. An important special class is that of (locally) PC^1 functions. The so-called *small B-subdifferential* is the set $D^\circ f(x) = \text{Limsup}_{\,\Omega \ni \omega \to x}\ Df(\omega)$. In this talk we show how the generalized derivative $D^\circ f$ can be applied for (parametric) Newton-type methods and characterize, depending on appropriate reformulations of nonlinear optimization or variational problems by Lipschitz equations, the concrete form of the Newton-auxiliary problems.

This approach was introduced and studied by B. Kummer in his paper "Generalized Newton and NCP- Methods: Convergence, regularity, actions" in *Discussiones Mathematicae - Differential Inclusions, Control and Optimization 20 (2000) 209-244* and also extensively handled by the authors in their book *Nonsmooth Equations in Optimization (Kluwer 2002).*

In the present talk we focus on applications to Karush-Kuhn-Tucker systems of nonlinear optimization problems and to complementarity problems. Though the reformulations arise by different approaches, e.g. by using so-called Kojima systems or NCP functions, it turns out that all auxiliary problems are SQP-models, which differ alone by the weights for the constraints and the terms of the objective.

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