aiming at semi-smooth Newton methods on shape vector bundles. Shape optimization problems constrained by VIs are very challenging because of the necessity to operate in inherently non-linear and non-convex shape spaces. In classical VIs, there is no explicit dependence on the domain, which adds an unavoidable source of non-linearity and non-convexity due to the non-linear and non-convex nature of shape spaces.

Lexicographic Derivatives

Prof. Paul Barton, MIT, USA

Nesterov's lexicographic derivatives is introduced and explanation of its advantage that is automatic computability is provided with comparison to computation of Clarke generalized derivatives that are not easily computed. Three types of sensitivity analysis with lexicographic derivatives are introduced as follows: (1) Sensitivity analysis with lexicographic derivatives of nonsmooth implicit functions is explained with a theorem of L-smooth implicit function is provided; (2) Sensitivity analysis of nonsmooth differential-algebraic equations and nonsmooth ordinary differential equations is provided; (3) Sensitivity analysis of nonlinear optimization problems with lexicographic derivatives is explained with many systems as well as nonsmooth KKT equation system.

Introduction to INTLAB

Prof. Siegfried M. Rump, Technische UniversitḦamburg, Germany

Summary of the features of INTLAB is explained by the original developer himself. INTLAB is a very popular tool for interval computation with Matlab and Octave. Many settled and new features are explained with adequate examples for indicating the performance and quality of the tool. At the meeting, Algorithmic Differentiation in INTLAB was extended by min and max to attack non-smooth functions. It will be available in the next version.

How Interval Measurement Uncertainty Affects the Results of Data Processing: A Calculus-Based Approach to Computing the Range of a Box

Prof. Vladik Kreinovich, University of Texas at El Paso, USA

In many practical applications, we are interested in the values of the quantities $y_1, \ldots, y_m$ which are difficult (or even impossible) to measure directly. A natural idea to estimate these values is to find easier-to-measure related quantities $x_1, \ldots, x_n$ and to use the known relation to estimate the desired values y_j. Measurements come with uncertainty, and often, the only thing we know about the actual value of each auxiliary quantity x_i is that it belongs to the interval $[\underline{x}_i, \overline{x}_i] = [\widetilde{x}_i - \Delta_i, \widetilde{x}_i + \Delta_i]$, where $\widetilde{x}_i$ is the measurement result, and Δ_i is the upper bound on the absolute value of the measurement error $\widetilde{x}_i - x_i$. In such situations, instead of a single value of a tuple $y = (y_1, \ldots, y_m)$, we have a range of possible values. In this talk, we provide calculus-based algorithms for computing this range.

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Piecewise smooth system and optimization with piecewise linearization via algorithmic differentiation

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