Minisymposium 20 - Nonlinear and Stochastic Optimization

Adaptive convexification for robust optimization problems

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We present a new numerical solution method for robust optimization problems in the absence of convexity. Its main idea is to adaptively construct convex relaxations of the lower level problem, replace the relaxed lower level problems equivalently by their Karush-Kuhn-Tucker conditions, and solve the resulting mathematical programs with complementarity constraints. In contrast to the commonly used approaches, this approximation produces *feasible iterates* for the original robust problem.
The convex relaxations are constructed with ideas from the αBB method of global optimization. The necessary upper bounds for functions on box domains can be determined using the techniques of interval arithmetic, where our algorithm already works if only one such bound is available for the problem.
We show convergence of stationary points of the approximating problems to a stationary point of original robust problem within arbitrarily given tolerances. Numerical examples illustrate the performance of the method.