A globally convergent primal-dual interior-point filter method for nonlinear programming (ipfilter): new filter optimality measures and computational results

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This talk describes the development of an optimization solver (ipfilter) for large scale nonlinear programming problems. The underlying algorithm is based on the primal-dual interior-point filter framework developed in the paper by M. Ulbrich, S. Ulbrich, and L. N. Vicente, A globally convergent primal-dual interior-point filter method for nonlinear programming, Mathematical Programming, 100 (2004) 379-410.

The method is based on the application of the filter technique to the globalization of the primal-dual interior-point algorithm, avoiding the use of merit functions and the updating of penalty parameters. The algorithm decomposes the primal-dual step obtained from the perturbed first-order necessary conditions into a normal and a tangential step. Each entry in the filter is a pair of coordinates: one resulting from feasibility and centrality (associated with the normal step); the other resulting from optimality (complementarity and duality) and related with the tangential step. The method possesses global convergence to first-order critical points.

We will describe the extension of the algorithm to new filter optimality entries which are, theoretically, better tailored to the purpose of minimization.

We will show some of the features of ipfilter, its current capabilities and limitations. We will present numerical results for large-scale problems.

This is joint work with Renata Silva (Univ. Coimbra), Michael Ulbrich (Tech. Univ. Munich), and Stefan Ulbrich (Tech. Univ. Darmstadt).