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Abstracts of Plenary and Invited Lectures

Section:

17. Control Theory and Optimization

1991 MS Classification: 65K05 90C30
Nocedal, Jorge, Northwestern University, Evanston, USA
Nonlinear Optimization: The Interplay Between Mathematical Characterizations and Algorithms

We discuss several fundamental questions concerning the problem of minimizing a nonlinear function subject to a set of inequality constraints. We begin by asking: What makes the problem intrinsically difficult to solve, and which characterizations of the solution make its solution more tractable? This leads to a discussion of the two main methods of solution: transformation and approximation.
Interior point methods make use of transformations. The nonlinear programming problem is recast a series of (more nonlinear) subproblems in which the constraints have been relegated to a secondary role. The key of their success lies not only in the proper subproblem formulation, but in exploiting their geometry to locate an approximate solution rapidly. Approximation methods, as represented by active-set sequential quadratic programming, take the opposite view and generate a series of mildly nonlinear subproblems. We do not yet know which of the two approaches will prove to be more powerful, but we present numerical results illustrating the strengths of each method.