NOTICE

MATHEMATICAL PROGRAMMING STUDY 30
Nonlinear Analysis and Optimization

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This study collects the papers of the conference: "Nonlinear Analysis and Optimization", which was held at the Center for Operations Research and Econometrics (C.O.R.E.) in Louvain-la-Neuve, on June 16-17, 1983.

It was the firm belief of the organizers of the meeting that there is a natural interaction between the methods in nonlinear analysis and the problems encountered in optimization and that gathering the papers in the same issue would be beneficial for both parties.

The papers of the Study are mainly concerned with the following themes: (i) nonlinear analysis (the first three papers), (ii) sensitivity (stability) analysis (the next two papers), and (iii) algorithms in nonlinear programming (for smooth, nonsmooth or global problems) (the last four papers). Abstracts of the papers follow.

Yves Chabrillac and J.-P. Crouzeix, Continuity and differentiability properties of monotone real functions of several real variables

Continuity and differentiability of monotone functions of several variables are studied; in particular, it is proved that these functions are almost everywhere differentiable. Then it is shown how some properties of Lipschitz functions and quasiconvex functions can be straightforwardly derived from properties of monotone functions.

Bernard Cornet, Regularity properties of open tangent cones

We show the link between different concepts of (open) tangent cones and give characterizations of different regularity properties of these cones, including the lower semicontinuity of the open tangent cone set-valued mapping. This paper continues work done by the author on closed tangent cones.

Georges Haddad, The role of tangent and normal cones in the viability theory of differential inclusions

This paper is a survey on the role played by tangent and normal cones for the existence of solutions to differential inclusions defined on a constrained set.
Stephen M. Robinson, Local structure of feasible sets in nonlinear programming, Part III: Stability and sensitivity

This paper continues the local analysis of nonlinear programming problems begun in Parts I and II. In this part we exploit the tools developed in the earlier parts to obtain detailed information about local optimizers in the nondegenerate case. We show, for example, that these optimizers obey a weak type of differentiability and we compute their derivatives in this weak sense.

Bernhard Gollan, Eigenvalue perturbations and nonlinear parametric optimization

It is well known that the eigenvalues resp. eigenvectors of symmetric matrices can be characterized as optimal values resp. solutions of nonlinear optimization problems. As a novelty, in this paper also the study of parameterized eigenvalue problems is traced back to that of parameterized nonlinear programming problems. We treat families of generalized eigenvalue problems indexed by a (vector-valued) parameter $p$ and study the eigenvalues as functions of $p$. This is done by employing recent results about the optimal value functions of nonlinear optimization problems. Thus some classical eigenvalue perturbation results are obtained but also new ones are derived, for instance when the data are only Lipschitzian or when $p$ is not scalar.

Throughout the paper emphasis is laid upon the optimization aspects of the problems. Further extensions of the theory employ deeper results from linear algebra and will be reported in a subsequent paper.

J.P. Bulteau and J.P. Vial, Curvilinear path and trust region in unconstrained optimization: A convergence analysis

In this paper we propose a general algorithm for solving unconstrained optimization problems. The basic step of the algorithm consists in finding a "good" successor point to the current iterate by choosing it along a curvilinear path and within a trust region. This scheme is due to Powell and it has been applied by Sorensen to a particular type of path. We give a series of properties that an arbitrary path should satisfy in order to achieve global convergence and fast asymptotic convergence. We review various paths that have been proposed in the literature and study the extent to which they satisfy our properties.

Alfred Auslender, Numerical methods for nondifferentiable convex optimization

In this paper, we study in Section 1 the proximal method, within a nonexact form for nonsmooth programming. In Section 2 we give a new algorithm, related with the cutting plane method for minimizing on $\mathbb{R}^N$ a convex function that is a sum of a Legendre convex differentiable function and a nondifferentiable convex function. This algorithm is then used in Sections III and IV to solve nonsmooth convex optimization problems in the unconstrained and the constrained cases.

A. Bihain, V. Hien Nguyen and J.-J. Strodiot, A reduced subgradient algorithm

In this paper, we propose an iterative algorithm designed to minimize a convex function subject to linear equality and bound constraints. The algorithm generalizes the reduced gradient algorithm of Wolfe while avoiding the hypothesis of differentiability. The set of variables is decomposed