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Introduction to sensitivity and stability analysis in nonlinear programming. (English)

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This book is a successful attempt to collect and unify mathematical programming sensitivity and stability results which are now abundant and far-reaching but scattered in the literature. In doing so, much attention is paid by the author to make these sophisticated and often very abstract results comprehensible and usable to practitioners.

The novelty of the approach is that numerous computational devices are developed for obtaining sensitivity and stability informations as a by-product of solution algorithms calculations. Here by sensitivity information is meant program parameter derivatives of the optimal value function or a 'Karush-Kuhn-Tucker triple' of a parametric nonlinear program, while 'stability information' refers to parametric bounds on the optimal value function or solution points. The mentioned computable techniques can easily be implemented and interfaced with the calculations required by any of the standard nonlinear programming codes.

This approach seems to be very natural, since sensitivity and stability calculations and solution algorithms calculations often involve similar data and the same manipulations. The practical applicability of the approach is demonstrated in detail through the calculation of sensitivity and stability information by a well known classical penalty function algorithm. Similar exploitation is indicated for the Newton method, projected and reduced gradient methods and augmented Lagrangian algorithms.

The book has 4 parts with the following headings: I. Overview; II. Theory and calculation of solution parameter derivatives; III. Algorithmic approximations; IV. Applications and future research.

Numerous references are supplemented by a rich bibliography of works not cited in the text, together with an author index and a subject index.

Reviewer: [H. Tuy](#)

MSC:

- [90C31](#) Sensitivity, stability, parametric optimization
- [90-02](#) Research exposition (monographs, survey articles) pertaining to operations research and mathematical programming
- [90C30](#) Nonlinear programming
- [49M37](#) Numerical methods based on nonlinear programming
- [90C25](#) Convex programming

Cited in **2** Reviews
Cited in **267** Documents

Keywords:

sensitivity; stability; parametric nonlinear program; solution algorithms; penalty function; reduced gradient; augmented Lagrangian algorithms