In Chapter 5, on model reduction, the ideas from Chapters 2, 3, and 4 are combined into a well-developed approach to the idea of producing as tight a formulation as is possible. Two new concepts are introduced to help in this search for a minimal formulation, a rigorous Maximal Activity Principle, and a heuristic Coincidence Rule. I found this theoretical approach to model reduction very appealing.

Global bound construction, the topic of Chapter 6, is the logical next step in the progression toward developing useful models. Constructing tight bounds, as the authors note, not only saves effort, but avoids accepting suboptimal solutions. Many techniques for constructing bounds are introduced here, from simple lower bounds to geometric inequalities, to unconstrained geometric programming. Combining these techniques into a process for model reduction using branch and bound is also discussed.

Chapter 7, on local computation, contains descriptions of various numerical algorithms for solving nonlinear programming problems. It is introduced with a brief section on choosing a method from among the large number of generally accepted techniques that are available. It contains sections on convergence, termination criteria, single variable minimization, Quasi-Newton methods, differencing, scaling, active set strategies, and Penalty and Barrier methods.

The real action is in Chapter 8, Principles and Practice. It begins with a review of the modeling techniques and approaches presented in the previous chapters. The goal is "to point out again the intimacy between modeling and computation that was explored first in Chapter 1." An optimization checklist is also provided for the novice modeler to use as a prompt while gaining more experience.

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1. K. L. HOFFMAN & M. W. PADBERG, *Techniques for Improving the Linear Programming Representation of Zero-One Programming Problems*, George Mason Univ. Tech. Rep., 1988.

2. H. CROWDER, E. L. JOHNSON & M. PADBERG, "Solving large-scale zero-one linear programming problems," *Oper. Res.*, v. 31, 1983, pp. 803–834.

28[65–01, 65Fxx].—DARIO BINI, MILVIO CAPOVANI & ORNELLA MENCHI, *Metodi Numerici per l'Algebra Lineare*, Zanichelli, Bologna, 1988, x+514 pp., 24 cm. Price L. 48 000 paperback.

An excellent treatment of numerical methods in linear algebra, this text is destined to become the standard work on the subject in the Italian language. It contains seven chapters, of which the first three are introductory, providing the necessary tools of matrix algebra, eigenvalue theory and estimation, and norms. Chapter 4 discusses the major direct methods, Chapter 5 the more important iterative methods, for solving linear algebraic systems. Methods for computing eigenvalues and eigenvectors of symmetric and nonsymmetric matrices are the subject of Chapter 6. The final chapter deals with least squares problems and related matters.

The exposition, throughout, is crisp and to the point. There is a healthy balance between theoretical analysis, the study of error propagation and complexity, and practical experimentation. Each chapter is provided with a superb collection of exercises—many supplied with solution sketches—and with historical notes and bibliographies. For future editions, however, the authors may wish to pay more attention to the correct spelling of names.

W. G.

29[68T99, 65D07, 65D10].—ANDREW BLAKE & ANDREW ZISSERMAN, *Visual Reconstruction*, The MIT Press Series in Artificial Intelligence, The MIT Press, Cambridge, Mass., 1987, ix+225 pp., $23\frac{1}{2}$ cm. Price $25.00.

This book appears in a series on artificial intelligence, and seems to be aimed primarily at computer scientists. However, mathematicians interested in computer vision will certainly want to look at it, and it may be of some peripheral interest to numerical analysts and approximation theorists interested in optimization and/or splines.

The subject is *visual reconstruction*, which is defined by the authors to be the process of reducing visual data to stable descriptions. The visual data may be thought of as coming from photoreceptors, spatio-temporal filters, or from depth maps obtained by stereopsis or optic rangefinders. Stability in this setting refers to the desire that the representation should be invariant to certain distortions such as sampling grain, optical blurring, optical distortion and sensor noise, rotation and translation, perspective distortions, and variation in photometric conditions.

The bulk of the book is devoted to the use of certain variational methods (called here weak strings, weak rods, and weak plates) for detecting edges (discontinuities in value or slope) of functions and surfaces. The methods are a form of penalized least squares, where the penalty includes a measure of smoothness of the function (typically an integral of a derivative) which is reminiscent of spline theory. These problems are analyzed using variational methods, and solved by discretizing them and applying an appropriate optimization method. The optimization method discussed here is referred to as the *graduated non-convexity algorithm*, and is designed to work on the nonconvex problems arising here. Convergence properties and the optimality of the algorithm are discussed.

The book includes about 150 references, mostly in the computer science literature. The authors seem to assume that the reader is familiar with much of this literature; results are often referred to without explanation. Readers not familiar with such things as "pontilliste depth map", "hyperacuity", "cyclopean space", or "data-fusion machine" may find the going hard. The authors have elected to "avoid undue mathematical detail", and despite several appendices, I expect that most mathematicians will not be fully satisfied.

L. L. S.