Preface

This volume comprises a selection of material based on presentations at the Eighth Australian Optimization Day, held in McLaren Vale, South Australia, in September 2001, and some additional invited contributions by distinguished colleagues, here and overseas. Optimization Day is an annual miniconference in Australia which dates from 1994. It has been successful in bringing together Australian researchers in optimization and related areas for the sharing of ideas and the facilitation of collaborative work. These meetings have also attracted some collaborative researchers from overseas.

This particular meeting was remarkable in the efforts made by some of the participants to ensure being present. It took place within days of the September 11 tragedy in New York and the financial collapse of a major Australian airline. These events left a number of us without air tickets on the eve of the conference. Some participants arrived in South Australia by car, having driven up to several thousand kilometers to join the meeting.

This volume has two parts, one concerning mathematical structure and the other applications. The first part begins with a treatment of nondifferentiability of cone-monotone functions in Banach spaces, showing that whereas several regularity properties of cone-monotone functions in finite-dimensional spaces carry over to a separable Banach space provided the cone has an interior, further generalizations are not readily possible. The following chapter concerns a comparison between linear and integer programming, particularly from a duality perspective. A discrete Farkas lemma is provided and it is shown that the existence of a nonnegative integer solution to a linear equation can be tested via a linear program. Next, there is a study of connections between generalized Lagrangians and generalized penalty functions for problems with a single constraint. This is followed by a detailed theoretical analysis of convergence of truncates in ℓ_1 optimal feedback control. The treatment permits consideration of the frequently occurring case of an objective function lacking interiority of domain. The optimal control theme continues with a study of asymptotic stability of optimal paths in nonconvex problems. The purpose of the chapter is to avoid the convexity conditions usually

assumed in turnpike theory. The succeeding chapter proposes a unified approach to Pontryagin's principle for optimal control problems with dynamics described by a partial differential equation. This is followed by a study of a turnpike property for discrete-time control systems in metric spaces. A treatment of duality theory for nonlinear programming includes comparisons of alternative approaches and discussion of how Mond–Weir duality and Wolfe duality may be combined. There are two linked chapters centered on the use of probabilistic structure for designing an improved algorithm for the determination of the fundamental matrix of a block-structured $M/G/1$ Markov chain. The approach via probabilistic structure makes clear in particular the nature of the relationship between the cyclic reduction algorithms and the Latouche–Ramaswami algorithm in the QBD case. Part I concludes with a chapter developing systematic classes of refinements of Hadamard's inequality, a cornerstone of convex analysis.

Although Part II of this volume is concerned with applications, a number of the chapters also possess appreciable theoretical content. Part II opens with the estimation of the sizes of correcting codes via formulation in terms of extremal graph problems. Previously developed algorithms are used to generate new exact solutions and estimates. The second chapter addresses the issue of optimal transforms of random vectors. A new transform is presented which has advantages over the Karhunen–Loève transform. Theory is developed and applied to an image reconstruction problem. The following chapter considers how to assign service capacity in a queueing network to minimize expected delay under a cost constraint. Next there is analysis of a control policy for stormwater management in a pair of connected tandem dams, where a developed mathematical technology is proposed and exhibited. Questions relating to the optimal design of linear consecutive-k-out-of-n systems are treated in two related chapters. There is a study of optimizing properties of plastics containing wood flour; an analysis of the approximation characteristics of constrained spanning and Steiner tree problems in weighted undirected graphs where edge costs and delays satisfy the triangle inequality; heuristics for speeding convergence in line search; and the use of alternative mathematical programming formulations for a real-world coal-blending problem under different scenarios.

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