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Preface

Problems of optimization are pervasive in the modern world, appearing in science, social science, engineering, business, industry, and defence. In view of the importance of optimization, the International Workshop on Optimization with High-Technology Applications (OHTA 2000), organized by the Department of Applied Mathematics of The Hong Kong Polytechnic University and the Department of Systems Engineering and Engineering Management of the Chinese University of Hong Kong, was held in Hong Kong during 23-25 October 2000. The Workshop brought together world class researchers working in fundamental and applications of optimization. It provided participants an excellent forum for exchanging ideas on the latest developments as well as future trend in modelling techniques, optimization theory and techniques, and their applications to high-tech industries. Let us first take this opportunity to thank our colleagues, L. Qi, X.Q. Yang, for their major roles in organising the Workshop.

This special Issue of the Journal of Global Optimization contains 12 papers originated from the presentations at OHTA2000. Each accepted paper had been accepted by a stringent refereeing process.

The 12 papers contained in this volume can be divided into three categories:

- Control
- Nonlinear Optimization
- Scheduling and Discrete Optimization

Control

This category contains 3 papers. In the paper by Helmke, Hüper and Moore, a new numerical scheme for computing balancing coordinate transformations for signature symmetric realizations in linear systems theory is presented. Local quadratic convergence of the algorithm is shown. The paper by Li, Zhou and Rami studies a stochastic linear quadratic problem in the infinite time horizon with Markovian jumps in parameter values, where the cost weighting matrices of the state and control are allowed to be indefinite. The well-posedness of the indefinite stochastic LQ problem is shown to be equivalent to the solvability of a system of coupled generalized algebraic Riccati equations (CGAREs) that involves equality and inequality constraints. An LMI-based algorithm is derived to solve the CGAREs via a semi definite programming. In the paper by Wang, Jennings and Teo, a finite volume method is presented for solving Hamilton-Jacobi-Bellman (HJB) equations

obtained from a class of optimal feedback control problems. This method is based on a finite difference volume discretization in state space coupled with an upwind finite difference technique, and on an implicit backward Euler finite differencing in time. This discretization scheme is absolutely stable. To show the effectiveness of this approach, numerical experiments on test problems with up to three states and two control variables were performed.

Nonlinear Optimization

This category contains 4 papers. In the paper by Bagirov and Rubinov, a global optimization problem of a Lipschitz function defined on a unit simplex is considered. The solution method is based on the combination of the cutting angle method in global optimization and a local search is proposed for solving this global optimization problem. In the paper by Qi, Wu and Zhu, a semi-infinite programming problem is considered. The equation and nonlinear complementarity conditions derived from the optimality conditions are first reformulated as a system of semi-smooth equations by using NCP functions. Then, some semi-smooth Newton methods are used to develop computational methods for solving this system of semi-smooth equations. These methods are shown to be globally and superlinearly convergent. In the paper by Mees and Tovey, it is shown that deterministic annealing can be understood in terms of bifurcation theory, which clarifies limitations of its convergence properties. In the paper, Mees and Tovey also indicate that it may be possible to improve deterministic annealing by using standard methods of nonlinear programming such as projected gradient methods. In the paper by Fang and Chen, the problem of blind channel identification based on noisy observation is considered. A stochastic approximation algorithm for estimating multichannel coefficients is proposed, and the estimate is proved to converge to the true parameters a.s. up-to a constant scaling factor.

Scheduling and Discrete Optimization

This category contains 5 papers. In the paper by Vairaktarakis and Cai, a production system that consists of m assembly stations arranged in series is considered. All jobs enter the assembly line at station 1 and proceed with subsequent stations in the same order as in a flow shop. Each job spends a fixed amount of time in each station. Level workforce scheduling objectives are defined and the complexity status of each associated problem is analysed. In the paper by Cheng and Shakhlevich, a bi-criterion approach is presented to solve a single-machine scheduling problem in which the job release dates can be compressed while incurring additional costs. The two criteria are the makespan and the compression cost. For the case of equal job processing times, an $0(n^4)$ algorithm is developed to construct integer

Parato optimal points. The algorithm developed can be modified to construct an ε-approximation of non-integer Parato optimal points. The complexity status of the problem with total weighted completion time criterion is also established. Brucker, Hurink, and Rolfes consider a railway carriage routing problem in their paper, to determine the routing of railway carriages such that the required carriages are always available when a train departs. A local search approach is developed to solve the problem, which utilizes the structure of the integer multi-commodity network flow formulation of the problem. Kubiak addresses the product rate variation problem in his paper. He finds that optimal JIT sequences are cyclic. This result provides an important theoretical support to the just-in-time practice in production systems. In the paper by Caccetta and Hill, they examine the techniques that are being used in the mining industry for production scheduling. The limitations of these techniques are indicated. In addition, a mixed integer linear programming model is presented for the scheduling problems along with a Branch and Cut solution strategy.

The completion of this issue would not have been possible without the assistance of many of our colleagues. We wish to express our sincere appreciation to all those who helped. In particular, our special thanks to Professor P.M. Pardalos for suggesting to organise the Workshop and for inviting us to edit this Special Issue. The generous supports provided by The Chinese University of Hong Kong, the Croucher Foundation, The Hong Kong Polytechnic University, and the K.C. Wong Education Foundation are gratefully acknowledged. Special thanks also to Mrs. Fanny Cheung for managing a major part of the refereeing process. We are deeply grateful to our referees who provided prompt and extensive reviews for all submissions. Their constructive comments contributed greatly to the quality of the issue.

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