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Editorial

This issue of *Computational Optimization and Applications* emanates from the Conference on Multiscale Optimization Methods and Applications, hosted by the Center for Applied Optimization at the University of Florida, February 26–28, 2004. The conference focused on the development of new solution methodologies, including general multilevel solution techniques, for tackling difficult, large-scale optimization problems that arise in science and industry. The conference, supported by a grant from the National Science Foundation, brought together researchers working in application areas as well as people working on fundamental aspects of algorithm development. Applications presented at the conference included:

(a) the circuit placement problem in VLSI design,
(b) the protein folding problem, and drug design,
(c) a wireless sensor location problem, -
(d) internet optimization,
(e) the siting of substations in an electrical network,
(f) optimal dosages in the treatment of cancer by radiation therapy,
(g) facility location, and
(h) shape and topology optimization.

These problems are challenging and intriguing, often easy to state, but difficult to solve.

Some of the research presented at the Gainesville conference in connection with these and other applications is highlighted in the book *Multiscale Optimization, Methods and Applications*, edited by W. W. Hager, S.-J. Huang, P. M. Pardalos, and O. A. Prokopyev, Springer, New York, 2006, ISBN 0-387-29549-6. The papers in the current issue of COAP focus on one of these applications, and highlight some recent developments in computational algorithms. The problem studied by Murray and Shanbhag, the first paper of this issue, is to determine the location of an electrical substation which satisfies future load constraints while minimizing the cost of the substation and the electrical losses when operating the substation. This leads to a mixed integer optimization problem, which is challenging for today's top software. The authors present a novel algorithm based on solving a series of relaxations.

Krishnan and Mitchell study the max-cut problem; that is, partition the vertices of a graph into two sets, while maximizing the total weight of edges connecting the two sets. This is one of the original NP-complete problems. The dual of the well-known semidefinite programming relaxation of the maxcut problem is formulated as a semi-infinite linear programming problem, which is solved within an interior point, cutting plane algorithm in a dual setting. Cutting planes are added to the primal problem to improve the semidefinite programming relaxation.

Dai and Yang give an elegant strategy for computing the optimal stepsize in a gradient method. For a convex quadratic they show that their stepsize, which is computed without a line search, approaches the optimal stepsize as the iterations converge.

The paper of Tong, Qi, and Yang concerns the problem of finding a solution to a system of equations subject to bound constraints. Often this feasibility problem is recast as a least squares optimization problem. One problem with this reformulation, is that a stationary point of the least squares problem may not satisfy the original constraints. This paper develops nonsmooth optimization techniques, based on Lagrangian globalization, for recovering a feasible solution.

Special thanks are given to all participants of the conference and to the conference sponsors at the University of Florida and the National Science Foundation.

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