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Editor's Introduction

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Editor's Introduction

The six papers in this issue deal with computational logic, fuzzy optimization, algorithm analysis, simulation, and heuristic search.

The first paper, *Input Proofs and Rank One Cutting Planes*, by John N. Hooker, Jr., extends earlier works that apply integer programming to computational logic. After a succinct description of the problem, the author proves an equivalence between support resolution (a technique used in artificial intelligence by computational logicians) and Chvàtal's rank one cuts (a fundamental system of implied linear inequalities derived simply from rounded aggregates). A principle outcome of this equivalence is an algorithm for resolution for the more difficult system having non-Horn clauses (that is, logical implications with more than one consequent).

The second paper, *Probabilistic Linear Programming with Measurable Multiattribute Value Functions*, by Masahiro Inuiguchi, Hidetomo Ichihashi and Hideo Tanaka, is concerned with multicriteria linear programs with uncertain coefficient values. They address the fact that alternative models have been considered, and they demonstrate the representability of their possibilistic form. The familiar expected utility using Lebesgue integration is replaced by a fuzzy integral, giving goals of maximizing possible value and maximizing necessary value. The induced deterministic equivalent is a nonlinear program, but with special structure exploited in their algorithm design.

The third paper, *Algorithmic Enhancements to the Method of Centers for Linear Programming Problems*, by Paul T. Boggs, Paul D. Domich, Janet R. Donaldson and Christoph Witzgall, reconsiders the method of centers in light of the recent surge of results inspired by Karmarkar's algorithm. One focus is on the need to recenter. Theoretical trajectory analysis is the source of insight, and the NETLIB Test Problems are used to indicate that a modification of Huard's Method of Centers could converge faster than a dual affine method. (Speed superiority is not, however, the principle result; rather, it is the insight of trajectory analysis and the reconsideration of abandoned techniques.)

The fourth paper, *A New Estimator of Sensitivity Measures of Simulations Based on Light Traffic Theory*, by Burton Simon, derives bounds on the derivatives of the mean sojourn time of a stable queueing system. The light traffic theory yields tractable functional values that form the basis for an effective bounding technique, which in turn serves as a new estimator for conducting sensitivity analysis. Traditionally, sensitivity questions have been a weak point of simulation as a viable technique for decision support in situations having many decision possibilities. Recent research emphasis, therefore, has been on overcoming this with simultaneous computation of sensitivity information as part of the simulation.

The fifth paper, *On the Greedy Solution of Ordered Problems*, by Avi Dechter and Rina Dechter, presents a new use of greedy algorithms to solve a certain class of hard problems, namely ordered problems, such as scheduling. Instead of applying the greedy algorithm to the original cost function (where the underlying structure is not a matroid), another objective is defined. In its worst case the approach is a new heuristic. More importantly, the authors demonstrate solvability of a new class of problems, those having "ranking functions" whose greedy optimum solves the original problem. The main result is a necessary and sufficient condition for a problem to be greedily optimized by a ranking function. In so doing, a new approach to classifying a problem as computationally hard or easy is introduced.

The sixth paper, *Tabu Search—Part I*, by Fred Glover, is the beginning of a seminal presentation, stemming from the author's mention in his 1977 application. It is a meta-strategy for heuristic search that trades off aspirations (of objective values) with prohibitions (of branches in the search tree). Originally designed for combinatorial optimization problems arising in operations research, like scheduling and sequencing, Tabu Search has already been applied to a diverse set of problems. One recent example is its application to building a neural network for character recognition. Other learning methods result in a set of synapses weights with spurious attractors (that is, whose energy function has minima not corresponding to stored images). Tabu search resulted in fewer spurious attractors, and research is being conducted as to why. Such applications comprise one of the principle topics to be included in *Tabu Search—Part II*, which will appear in the next issue.

We continue to see the diverse interfaces between Operations Research and Computer Sciences. These articles reflect that diversity, and we can expect even more in the future.

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Editor