Editorial

Logistics: From Theory to Application (ECCO XIV)

This special issue of *European Journal of Operational Research* is devoted to the ECCO XIV Conference, the fourteenth annual meeting of the European Chapter on Combinatorial Optimization, held at the University of Bonn (Germany), from May 31 to June 2, 2001.

ECCO, the EURO Working Group on Combinatorial Optimization, was created in 1987 by C. Roucairol, D. De Werra and A. Rinnooy Kan. It provides an excellent opportunity to discuss recent and important issues in combinatorial optimization and its applications. The group, which has about 500 members, is open to everybody interested in the field, either in theoretical aspects or in business, industry or public administration applications. During the first ten years, Catherine Roucairol (Université de Versailles, France) coordinated the ECCO activities. The current coordinator is Silvano Martello (Università di Bologna, Italy).

The ECCO meetings are held on a regular basis (once a year during Spring) and are devoted to all aspects of combinatorial optimization: operations management and logistics, production scheduling, location and distribution problems, resource allocation, flexible manufacturing, scheduling, VLSI design and computer design, network optimization, etc. Recently, special sessions in ECCO meetings put particular emphasis on new local search methods (tabu, genetic algorithms, simulated annealing), polyhedra approaches to difficult problems and recent developments in classical optimization problems (such as scheduling, assignment, knapsack, partitioning, etc). At ECCO meetings usually about 100 participants nicely combine scientific works and exchange of new ideas with an exciting atmosphere like Paris (May 1988), Venice (June 1989), Barcelona (May 1990), Dubrovnik (May 1991, canceled due to the unstable political situation in Croatia), Graz (April 1992), Bruxelles (April 1993), Milano (February 1994), Poznan (May 1995), Dublin (April 1996), Tenerife (May 1997), Copenhagen (May 1998), Bendor (May 1999), Capri (May 2000), Bonn (2001), Lugano (2002), Molde (2003).

The Scientific Program Committee for ECCO XIV was formed by Jacek Błażewicz (Poznan), Van-Dat Cung (Versailles), Alain Hertz (Lausanne), Silvano Martello (Bologna), Erwin Pesch (Siegen) and Paolo Toth (Bologna). The meeting was organized by Erwin Pesch, who was at that time the head

of the Chair of Business and Production Management of the University in Bonn. We would like to thank Jens Vygen and Andre Rohe, both from the Research Institute for Discrete Mathematics, for their service in the organizing committee.

During the conference, the following plenary talks were given:

- Bernhard Korte, "Discrete optimization methods for VLSI-design";

- Endre Boros, "Generating all minimal solutions of monotone systems: The case of polymatroid separators";

- Fred Glover and Manuel Laguna, "New methods and computational results for combinatorial optimization problems";

- Moshe Dror, "Partitioning the ground set in combinatorial optimization: Examples and Implications".

Additionally,

- Bernhard Korte gave an excellent guided tour through the *Arithmeum*, the world's largest museum of mechanical computers;

- at the *Effelsberg Radio Observatory*, Norbert Junkes from the Max Planck Institute for Radio-Astronomy in Bonn took the conference participants to an exciting excursion through space and time and explained "Recent Developments in Radio-Astronomy".

In three parallel streams, twenty three sessions on the following topics were organized: combinatorial optimization, location, coloring, heuristics, metaheuristics, network design, graphs, cutting and packing, routing, scheduling, manufacturing, mathematical programming, traveling salesman.

An improved logistics can give a company a competitive advantage by providing a product or service at the right time at the right place in a way that customers value more than the competition's. Designing a logistic system that gives a competitive advantage requires an understanding of the company's logistic processes and of the technology used to build solutions for the logistic problems. This special issue presents a selection of twelve papers on theoretical and practical aspects from logistics.

Decisions about the distribution system and facility location, e.g. production plants, warehouses etc., are a strategic issue for almost every company. The ability to reach competitive advantage and a high service quality depends also on the location of the facilities in relation to other facilities.

Model formulations and solution algorithms vary widely in their assumptions, mathematical complexity and computational performance. The first paper by Klose and Drexl presents the current state-of-the-art, and summarizes continuous location models, network location models, mixed-integer programming models as well as their use in practice.

The next paper has applications in location of switching centers in communication networks or the consolidation of customer orders to vehicle shipment. Ahmadi and Osman consider the capacitated clustering problem, i.e., a given set of n weighted points is to be partitioned into p clusters such that, the total weight of the points in each cluster does not exceed a given cluster capacity. The objective is to find a set of p centers that minimises the total scatter of points allocated to these centers. The authors propose a greedy random adaptive search procedure in combination with tracking information on the best components of solutions.

Logistics, i.e. managing flows of goods, information and money between consumers and suppliers, requires to schedule jobs, for instance customer orders, as close as possible to their assigned due dates. As jobs often compete for resources, e.g. a machine, the schedule must ensure that all jobs are treated as equally as possible given their duration and relative importance. To achieve this goal a weighted completion time variance has been suggested as an objective function for scheduling to capture the equality. Cheng and Kubiak present an algorithm producing a schedule within a given relative error from an optimal one. They present the fastest fully polynomial time approximation scheme for minimizing the completion time variance with agreeable weights on a single machine.

Costa, Letocart and Roupin present a survey about the maximum integral multiflow and minimum multicut problems and their subproblems, such as the multiterminal cut and the unsplittable flow problems. The integer multicommodity flow problem is to maximize the sum of the integral flows of each commodity between terminal vertices subject to capacity and flow conservation constraints. The multicut problem is to find a minimum weight set of edges whose removal separates the terminal vertices. Such problems have got many applications, for instance, in telecommunication, routing and railroad transportation. Costa et al. provide recent complexity results concerning the approximability and the NP-hardness of the basic problems and they describe polynomial algorithms for various kinds of graphs.

Routing hazardous materials, e.g. explosive or radioactive materials, is an important issue in industrialized societies. Designing safe routes is critical for reducing the consequences of an accident. Dell'Olmo and Gentili

consider the problem of finding a set of alternative paths, i.e. determining spatially dissimilar paths, between an origin and a destination in order to equally distribute the total risk among the population exposed.

Integrating manufacturing and logistic functions together is important for an organization to obtain the competing advantages in business. An important issue in integrated logistic network design is the tradeoff between inventory investment and end-customer service levels. Dong and Chen introduce an analytic framework to be used for both performance modeling and analysis. The validity of the proposed model is illustrated by comparing the results from the analytical performance evaluation model and those obtained from a simulation study.

Hurink and Knust consider a generalized job-shop problem where the jobs additionally have to be transported between the machines by a single transport robot. The authors present local search algorithms for this problem where neighborhood structures are defined using problem-specific knowledge.

Janiak, Kovalyov and Portmann partition a set of jobs into groups such that jobs of the same group are processed contiguously on a machine. A sequence independent setup time precedes the processing of each group. Two renewable resources can be used to linearly compress setup and job processing times. Janiak et al. generate optimal job sequences meeting the job deadlines and minimizing the total weighted resource consumption in polynomial time.

Lübbecke's paper describes a reduction of the state space of dynamic programming algorithms used as column generators in solving the linear programming relaxation of set partitioning problems.

Nagy and Salhi consider the vehicle routing problem with pickups and deliveries where the vehicles are not only required to deliver goods to customers but also to pick some goods up at customer locations. The objective function is to minimize the total distance traveled by the vehicles, subject to maximum distance and maximum capacity constraints on the vehicles. Contributions of this paper is to produce efficient heuristics for the problem with simultaneous pickups and deliveries and to extend the methodology to the multiple depot problem. Heuristics are taken from the vehicle routing methodology but modified such that their aim becomes the reduction of infeasibilities.

Riera-Ledesma and Salazar-Gonzales describe a local search approach for the traveling purchaser problem, i.e. selecting a subset of markets such that a given demand of products can be purchased, minimizing the travel

cost and the purchasing cost. They perform a k-exchange of markets and a neighbor of a given solution is a solution where a path of consecutive markets is replaced by other markets.

In order to remain competitive and be economically successful, a company has focused on increasing productivity, improving efficiency and the products' quality. Wang and Sarker's paper aims at increasing the degree of efficiency within the production processes and reduce the level of inventory involved in each production stage. The objective is to build a logistics system for a assembly-type supply chain system controlled by kanban technique. Optimal configuration of the kanban operation at each stage leads to minimal total costs of the supply chain.

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