Guest Editorial

This special issue is related to a track ‘Scheduling in Manufacturing Systems’ presented at the 13th IFAC Symposium on Information Control Problems in Manufacturing (INCOM 2009) which was held on June 3–5, 2009, at the Trapeznikov Institute of Control Sciences of the Russian Academy of Sciences in Moscow / Russia. The organizers of this track have also edited this special issue.

This IFAC symposium is more or less a triennial conference which is worldwide recognized as one of the leading IFAC conferences promoting research in the fields of industrial engineering, automatic control, computer science & engineering and information technology applied to manufacturing systems. These symposia attract a large number of outstanding scientists worldwide. Subjects of these conferences are e.g. the design and reconfiguration of manufacturing systems, inventory control, production planning and scheduling, intelligent manufacturing systems or discrete event systems in manufacturing. The most recent conferences in this series were held in Vienna / Austria (2001), Salvador de Bahia / Brazil (2004) and Saint-Etienne / France (2006). The symposium in Moscow (2009) has been attended by 654 scientists including 112 industrial representatives. After receiving approximately 1500 reviews by about 600 reviewers who participated in the refereeing process, 359 papers have been accepted and finally, 346 papers (62 % of the submissions) have been presented at the symposium which covered three main areas:

- information systems, control and interoperability,
- industrial engineering and
- operations research.

In addition, 10 keynote presentations were given and 18 prizes for best papers have been awarded at the symposium. The next symposium of this series will be held on May 23–25, 2012, hosted by the University Polytechnica of Bucharest / Romania.

As well as the participants of this symposium, the wider community of the operations research society was invited to submit their latest research results in this area. We received 48 submissions for this special issue. After a careful refereeing process by at least two referees for each paper, 12 of these papers have been accepted which corresponds to an acceptance rate of 25 %. The majority of papers in this special issue is devoted to single and parallel machine problems. We hope that the readers of *Computers & Operations Research* find stimulating ideas and interesting results in the papers of this issue, that we introduce hereafter.

Cesaret, Oguz and Salman investigate a make-to-order production system, where limited production capacity and tight delivery requirements necessitate selecting orders to maximize total revenue. The authors present a tabu search algorithm for the order acceptance and scheduling problem on a single machine with given release dates and sequence-dependent setup times. The performance of the tabu search algorithm is compared with two heuristics from the literature for instances with up to 100 orders.
Cheng, Lin and Huang consider the relocation problem arising from public re-development projects cast. While the two processes of tearing down and re-constructing each building are often viewed as a single operation, the two processes are considered as separate in this paper. The problem is formulated as a resource-constrained two-machine flow-shop scheduling problem. In addition to formulations of the problem, complexity issues are discussed and polynomial algorithms are presented for several special cases.

Della Croce, Garaix and Grosso consider heuristic algorithms for the problem of minimizing total weighted tardiness on a number of identical parallel machines. For this problem an improved iterated local search (ILS) algorithm is presented which incorporates very large neighborhood search techniques. In particular, a dynasearch optimization is introduced on each machine, and the size of the neighborhood used is non-polynomial in the number of machines. Computational results show that an existing ILS algorithm for this problem is outperformed for instances with up to 300 jobs and 20 machines.

Dolgui, Gordon and Strusevich consider the problem of minimizing the makespan on a single machine under the assumption that the processing time of a job depends on its position. This can be modelled by imposing precedence constraints on the set of jobs. It is shown that the objective functions for the problem under consideration satisfy the job module property and process the recursion property and thus, such problems can be polynomially solved. Unfortunately, during the preparation of this issue, Prof. Valery Gordon passed away at an age of 65 on June 4, 2010.

Keskinturk, Yildirim and Barut study the problem of minimizing the average relative percentage of imbalance with sequence-dependent setup times in a parallel machine environment. After presenting a mathematical model, some heuristics and two metaheuristics, namely a genetic and an ant colony algorithm, are suggested. The algorithms are tested on problems with up to 60 jobs, and it appears that the ant colony algorithm outperforms the other ones.

Lamothe, Marmier, Dupuy, Gaborit and Dupont suggest scheduling rules for minimizing total tardiness in a parallel machine environment taking setup and calendar constraints into account. The problem arises at the stage of quality control in pharmaceutical and cosmetics industries. The authors present new rules and a simulated annealing algorithm. The algorithms have been tested for two load situations with 70 and 140 jobs, respectively.

Manoj, Sriskandarajah and Wagner investigate the benefits of coordination between two adjacent stages in a production system. The objective of the first stage is to minimize the inventory cost, and the goal of the second stage is to minimize the tardiness cost and the re-sequencing cost in the buffer. The performance of the system is measured by the total cost. It is shown that the system problem is NP-hard while the individual problems can be polynomially solved. Finally a genetic algorithm based on the idea of non-dominated sorting is developed for solving the system problem.

Rakrouki, Ladhari and T’kindt consider the problem of minimizing total completion time on a single machine problem subject to given release dates. For this problem, a metaheuristic is presented which uses both genetic local search and recovering beam search.
The computational results show that the use of this new hybrid approach provides a significant improvement of the state-of-the-art heuristics for this problem.

Sadykov investigates the problem of scheduling malleable jobs to minimize the total completion time. For this problem, a class of ascending scheduling is introduced, and it is proven that under natural assumptions this class of schedules is dominant for the problem under consideration. Thus, this result can be used for reducing the search space when looking for an optimal solution.

Sotskov and Lai consider the single machine problem with interval processing times to minimize total weighted completion time. They calculate minimal dominant sets of job permutations and introduce a new stability measure, called a stability box. Properties of such a box are investigated which allow to develop a polynomial algorithm for constructing a permutation with the largest volume of a stability box. Extensive numerical results are presented for problems with up to 1000 jobs.

Yildiz, Karasan and Akturk investigate an \( m \)-machine robot centered cell producing identical parts on identical CNC machines. For minimizing the cycle time with uniform and fixed processing times on each machine, a cyclic time lower bound of pure cycles is presented, and two pure cycles are proposed which dominate the rest of the pure cycles for a large range of processing time values. Moreover, a cycle time lower bound is derived for controllable processing times. Finally, for the 3-machine case, the bicriteria optimization problem of minimizing both the cycle time and the total manufacturing cost simultaneously is solved.

Zhao and Tang study a single machine scheduling and due-window assignment problem. The processing time of a job is a linear function of its starting time and the job-independent deterioration rates are identical for all jobs. The objective is to minimize the sum of earliness and tardiness and due-window starting time and due-window size costs. For this problem, a polynomial algorithm is given. The approach is illustrated by a numerical example.

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