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Editorial

Scheduling with Time-Dependent Processing Times

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Scheduling with time-dependent processing times means that the job processing times can be prolonged due to deterioration or shortened due to learning over time, which happens in many real-life situations. This issue contains 18 interesting papers considering such scheduling problems in the single-machine, flowshop, and parallel-machine settings.

Ten of the papers study scheduling with learning and/or deteriorating jobs in different machine settings. T. C. E. Cheng et al. propose a model where the learning effect accelerates as time goes by. They derive the optimal solutions for several single-machine problems. Der-Chiang Li et al. explore a single-machine problem with the learning effect and release times to minimize the total completion time. They develop a branch-and-bound algorithm and a genetic algorithm-based heuristic for this problem. T. C. E. Cheng considers a permutation flowshop scheduling problem with a position-dependent exponential learning effect to minimize the makespan and the total flow time. Taking into consideration a set of newly arrived jobs that may create disruption to a set of original jobs that have already been scheduled, Y. Zhang and Chi-Chung Wang consider four cases of minimization of the total tardiness cost with agreeable job parameters, subject to a limit on the disruption of the original job sequence. X. Yu and Y. Zhang investigate a general deterioration model where the actual processing time function of a job depends not only on the job's scheduled position in the job sequence but also on the total weighted normal processing times of the jobs already processed. L. Wan reviews the problem of scheduling n deteriorating jobs on a single machine to minimize the makespan and provides a new fully polynomial-time approximation scheme for the problem. Cho-Jung Hsu studies single-machine scheduling with aging effects and optional assignment of a maintenance activity. H. Nian and Z. Mao address the single-machine scheduling problem with simultaneous consideration of job rejection, deterioration effects, and deteriorating multimaintenance activities. J. Qian and G. Steiner consider single-machine scheduling with learning/deterioration effects, time-dependent processing times, and due date assignment to minimize the weighted number of tardy jobs. Applying the idea of deteriorating effect to the integrated inventory routing problem, Tao Jia et al. propose a two-echelon supply chain mixed integer programming model by taking into consideration the products' deteriorating costs.

Five papers study multiagent scheduling with deteriorating jobs or learning effects or both. Gen-Han Wu considers two-agent scheduling on a single machine involving learning effects and deteriorating jobs simultaneously. Der-Chiang Li and Chon-Jung Hsu address a scheduling problem in which two agents compete to perform their own jobs with release times on a common single machine with the learning effect. Jan-Yee Kung et al. study a two-agent single-machine scheduling problem in which the jobs have both time-dependent processing times and ready times. They provide a branch-and-bound and metaheuristic methods to find the optimal and near-optimal solutions, respectively. P. Liu and X. Tian introduce a model that considers both resource-dependent starting times and two agents. Y. Qi and L. Wan consider a two-agent problem on parallel-machines with release dates and preemption.

There are three application papers: H. Yamazaki et al. consider scheduling problems in heterogeneous systems,

Yi-Feng Hung et al. consider scheduling of semiconductor multihead testers, and S. Hu et al. study a place scheduling problem.

We hope these papers enrich the state of research on scheduling with time-dependent processing times and provide a guide to the reader on ways to treat this thriving and other closely related topics.

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