A Computational Study of an Automated Negotiation Scheme to Solve Multiple Criterion Single Machine Scheduling Problems

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Abstract: In this talk, an automated negotiation mechanism is presented to solve multiple criterion single machine scheduling problems. We consider a single machine that is utilized by two agents that have own jobs and private objectives. The objective of the first agent consists in minimizing the total weighted completion time of its jobs whereas the objective of the second agent is related to minimizing maximum lateness of its jobs. Scheduling problems of this type have recently attracted the interest of researchers in scheduling theory (cf. [BS03], [BF09]). The researched problem is also motivated by scheduling problems found in semiconductor manufacturing. The basic ingredient of the mechanism is a mediator that proposes contracts that are sent to the two agents as suggested by Fink [Fi06]. The contracts are proposed using a variable neighborhood search (VNS) technique. We study the behavior of greedy and cooperative agents. Furthermore, we study a hybrid strategy suggested by Klein et al. [KF03a], [KF03b] where the mediator accepts a deterioration of the two objective values with a certain probability. The performance of the suggested negotiation protocols is assessed using a large set of randomly generated problem instances. It turns out that the solutions determined by the automated negotiation mechanism are close to the Pareto frontier that can be derived when a centralized approach with full information is assumed. We use the NSGA-II algorithm [DP02] to determine the solutions on the Pareto frontier.

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