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Effectiveness of Adaptive Crossover Procedures for a Genetic Algorithm to Schedule Unrelated Parallel Machines with Setups

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Abstract—The unrelated parallel machine scheduling problem, in its most general form, is applicable to many manufacturing and service environments. This problem requires the scheduling of a group of independent jobs on unrelated parallel machines as well as the sequencing of the jobs on each individual machine. In this paper, we propose a genetic algorithm with adaptive crossover selection to schedule independent jobs on unrelated parallel machines to minimize total tardiness. Each job has a unique due date, machine-dependent processing times, and sequence-dependent setup times. Three general adaptive crossover selection schemes will be compared with a traditional genetic algorithm and tabu search for large-scale problems (up to 200 jobs and 20 machines). The adaptive genetic algorithm with the tournament selection scheme is shown to outperform all other heuristics with respect to solution quality although it does require more solving time than many of the other heuristics.

Keywords—Unrelated parallel machine scheduling, Genetic algorithms, Sequence-dependent setups

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