

New MIP models for the scheduling of unrelated parallel machines with sequence dependent setup times

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Abstract

The unrelated parallel machines scheduling problem with the additional consideration of machine and job sequence dependent setup times and makespan minimization, is an important and general problem for the manufacturing industry. It deals with the assignment of n jobs to m machines that are disposed in parallel. At each machine, a setup operation must be carried out after processing one job and before processing the next one. This setup depends on the job sequence and on the machine and therefore, the job schedule at each machine must also be obtained. Its exact solution has eluded researchers for a long time for anything larger than a few jobs and machines. In this work we present several alternative mixed integer linear programming formulations, obtained after modelling the problem following other well-known settings in the optimization literature. These models mimic special cutting and packing scenarios, flow problems, heterogeneous fleet vehicle routing and m -traveling salesman, among others. We compare several different formulations against a standard model and a very efficient formulation adapted from the literature. The results, obtained after solving thousands of small and medium instances show that some of the proposed formulations are extremely efficient and allow solving to optimality some medium sized problems of practical use in practice with state-of-the-art solvers.