Solving the Selective Multi-Category Parallel-Servicing Problem

In this paper we present a new scheduling problem and describe a shortest path based heuristic as well as a dynamic programming based exact optimization algorithm to solve it. The Selective Multi-Category Parallel-Servicing Problem (SMCPSP) arises when a set of jobs has to be scheduled on a server (machine) with limited capacity. Each job requests service in a prespecified time window and belongs to a certain category. Jobs may be serviced partially, incurring a penalty; however, only jobs of the same category can be processed simultaneously. One must identify the best subset of jobs to process in each time interval of a given planning horizon while respecting the server capacity and scheduling requirements. We compare the proposed solution methods with a MILP formulation and show that the dynamic programming approach is faster when the number of categories is large, whereas the MILP can be solved faster when the number of categories is small.