Proterv-II: An Integrated Production Planning and Scheduling System⋆

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Medium-term production planning and short-term scheduling match future production load and capacities over various horizons and on different levels of detail. Although these two levels of the decision hierarchy are strongly interdependent, traditional systems handle them separately. In the Proterv-II prototype system that was developed for manufacturing industries, the two levels are linked by an automated aggregation procedure that constructs the planning representation from detailed job-shop level data [3].

Projects consist of a number of discrete operations with various resource requirements, interwoven by precedence constraints. Aggregation merges connected components of projects into aggregate activities. The medium-term planner solves a resource-constrained project scheduling problem with variable-intensity activities, subject to strict time windows, but extendible capacities. The objective functions are minimal extra capacity usage and minimal work-in-process. For the solution of the planning problem, an MILP model and a branch-and-cut algorithm with customized cutting planes have been developed [1].

The goal of the short-term scheduler is to unfold the first segments of the medium-term plan into executable detailed schedules. The scheduler computes start times for individual manufacturing operation with respect to resource requirements, precedence relations, sequence-independent setup times, and transportation times. The detailed scheduling problem is solved by constraint-based scheduling techniques. During experiments on large-scale industrial data, Proterv-II generated close-to-optimal production plans that could be unfolded into executable schedules. We are currently improving the performance of the scheduler by novel algorithms adapted to real-life problems [2].

References

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