PARALLEL-MACHINE SCHEDULING OF GENERALIZED UNIT-TIME JOBS

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ABSTRACT

In this dissertation, we consider two models of parallel-machine scheduling of precedence-constrained jobs with variable processing times. In case of the first model, in which unit jobs have position-dependent processing times, we introduce a certain transformation and prove its properties. We also show the conditions under which this transformation generates, in linear time, an optimal schedule for generalized unit-time jobs, provided that an optimal schedule for jobs with fixed processing times is known. Based on these results, we show how to solve several of the considered problems in polynomial time. We also present polynomial algorithms for two-machine scheduling problems with generalized unit-time jobs and with precedence constraints in a form of a chain.

In case of the second model, job processing times are described by proper Riemann integrals with limits depending on the sum of processing times of jobs executed earlier. We introduce a transformation related to this model and present its properties. This transformation is used to present pseudo-polynomial algorithms for several problems with integral-based processing times.

The results and notions concerning both the above models are illustrated with examples. We also present some open problems and point out the difficulties associated with their solution.