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Cumulative scheduling with variable task profiles and concave piecewise linear processing rate functions. (English) [Zbl 1384.90047](#)
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Summary: We consider a cumulative scheduling problem where a task duration and resource consumption are not fixed. The consumption profile of the task, which can vary continuously over time, is a decision variable of the problem to be determined and a task is completed as soon as the integration over its time window of a non-decreasing and continuous processing rate function of the consumption profile has reached a predefined amount of energy. The goal is to find a feasible schedule, which is an NP-hard problem. For the case where functions are concave and piecewise linear, we present two propagation algorithms. The first one is the adaptation to concave functions of the variant of the energetic reasoning previously established for linear functions. Furthermore, a full characterization of the relevant intervals for time-window adjustments is provided. The second algorithm combines a flow-based checker with time-bound adjustments derived from the time-table disjunctive reasoning for the cumulative constraint. Complementarity of the algorithms is assessed via their integration in a hybrid branch-and-bound and computational experiments on small-size instances.

MSC:

[90B35](#) Deterministic scheduling theory in operations research

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Keywords:

[continuous scheduling](#); [continuous resources](#); [concave piecewise linear functions](#); [energy constraints](#); [energetic reasoning](#)

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