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Linear-time filtering algorithms for the disjunctive constraint and a quadratic filtering algorithm for the cumulative not-first not-last. (English) [Zbl 1457.90067](#)
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Summary: We present new filtering algorithms for DISJUNCTIVE and CUMULATIVE constraints, each of which improves the complexity of the state-of-the-art algorithms by a factor of $\log n$. We show how to perform Time-Tabling and Detectable Precedences in linear time on the DISJUNCTIVE constraint. Furthermore, we present a linear-time Overload Checking for the DISJUNCTIVE and CUMULATIVE constraints. Finally, we show how the rule of Not-first/Not-last can be enforced in quadratic time for the CUMULATIVE constraint. These algorithms rely on the union find data structure, from which we take advantage to introduce a new data structure that we call it time line. This data structure provides constant time operations that were previously implemented in logarithmic time by the Θ -tree data structure. Experiments show that these new algorithms are competitive even for a small number of tasks and outperform existing algorithms as the number of tasks increases. We also show that the time line can be used to solve specific scheduling problems.

MSC:

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

[68T20](#) Problem solving in the context of artificial intelligence (heuristics, search strategies, etc.)

Keywords:

[scheduling](#); [global constraint](#); [filtering algorithms](#); [disjunctive](#); [cumulative](#); [data structure](#)

Software:

[BL data set](#)

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