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New filtering for `ATMOSTNVALUE` and its weighted variant: a Lagrangian approach. (English)

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Summary: The `ATMOSTNVALUE` global constraint, which restricts the maximum number of distinct values taken by a set of variables, is a well known NP-Hard global constraint. The weighted version of the constraint, `ATMOSTWVALUE`, where each value is associated with a weight or cost, is a useful and natural extension. Both constraints occur in many industrial applications where the number and the cost of some resources have to be minimized. This paper introduces a new filtering algorithm based on a Lagrangian relaxation for both constraints. This contribution is illustrated on problems related to facility location, which is a fundamental class of problems in operations research and management sciences. Preliminary evaluations show that the filtering power of the Lagrangian relaxation can provide significant improvements over the state-of-the-art algorithm for these constraints. We believe it can help to bridge the gap between constraint programming and linear programming approaches for a large class of problems related to facility location.

MSC:

90C11 Mixed integer programming

Cited in 3 Documents

Keywords:

global constraint; filtering algorithm; Lagrangian relaxation; at most n values

Software:

AtMostNValue; ToulBar2

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