Liu, Yan-Li; **Li, Chu-Min**; **He, Kun**; **Fan, Yi**

Breaking cycle structure to improve lower bound for Max-SAT. (English) Zbl 07048079

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Summary: Many practical optimization problems can be translated to Max-SAT and solved using a Branch-and-Bound (BnB) Max-SAT solver. The performance of a BnB Max-SAT solver heavily depends on the quality of the lower bound. Lower bounds in state-of-the-art BnB Max-SAT solvers are based on detecting inconsistent subsets of clauses and then on applying Max-SAT resolution to transform each inconsistent subset of clauses into an equivalent set containing an empty clause and a number of compensation clauses. In this paper, we focus on the transformation of the inconsistent subsets of clauses containing one unit clause and a number of binary clauses. We show that Max-SAT resolution generates a lot of ternary compensation clauses when transforming such an inconsistent set, deteriorating the quality of the lower bound, and propose a new inference rule, called cycle breaking rule, to transform the inconsistent set. We prove the correctness of the rule and implement it in a new BnB Max-SAT solver called Brmaxsat. Experimental results showed that cycle breaking rule is very effective, especially on Max-2SAT.

For the entire collection see [Zbl 1407.68047].

MSC:

68Wxx Algorithms in computer science

Keywords:

NP-complete; Max-SAT; branch and bound; lower bound

Software:

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