MaxSAT Solver SC2016* (internal technical report)

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Abstract

In computer science, MaxSAT is among the conceptually simplest combinatorial optimisation problems, where the goal is to find the best solution from a set of possible solutions. Despite this simplicity, instances of optimisation problems from many application domains can be represented as MaxSAT in an easy and natural way.

The solver SC2016 was created on purpose for the participation in the *11th* MaxSAT *Evaluation* (aka MaxSAT 2016 Competition). This competition was organised as an affiliated event of the 19th International Conference on Theory and Applications of Satisfiability Testing (SAT-2016). There, it won 1x First Place, 3x Second Place, 4x Third Place — against 16 other approaches.

The MaxSAT optimization problem considers a Boolean formula φ in conjunctive normal form:

$$\varphi = \bigwedge_{i=1}^{m} \bigvee_{j=1}^{k} a_i^j,$$

where each a_i^j is a literal from $\{x_i, \overline{x}_i \mid i \leq n\}$. It asks for an assignment of truth values to the variables x_i which maximizes the number of $i \leq m$ such that $\bigvee_{j=1}^{k} a_i^j$ is true (such a conjunct is called a *clause*).

Applications of satisfiability problems are at the core of automatic theorem proving, but there are also many applications in further areas such as planning [6] and verification, for example for microprocessors [5]. Typically, desired properties of a formal system are encoded in different clauses and the satisfiability of the resulting formula corresponds to the correctness of the system.

The basis for our SC2016 is the solver CCLS [3], an incomplete MaxSAT solver. Note that CCLS was the winner of two categories of the MaxSAT 2015

*This work has been supported by the ARC Discovery Early Career Researcher Award DE160100850.

competition and thus represented a state-of-the-art optimizer for the MaxSAT problem. The CCLS code is available online [4].

We performed a variant of algorithm configuration optimisation [2] on the open and hidden parameters of CCLS using the over 5000 instances from the MaxSAT 2015 Competition [1]. Technical details of the tuning will be revealed once the corresponding article has been accepted for publication.

References

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