**Solver name** QMaxSAT

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**Description** QMaxSAT(Q-dai[1] MaxSAT solver) is a Partial MaxSAT solver built on top of MiniSat 2.0[1]. This follows a SAT-based approach developed by Daniel Le Berre in SAT4Jmaxsat.

Given a Partial MaxSAT instance $\phi = \{H_1, \ldots, H_m, S_1, \ldots, S_n\}$ where $H_i (1 \leq i \leq m)$ is a hard clause and $S_j (1 \leq j \leq n)$ is a soft clause, a new blocking variable $b_j (1 \leq j \leq n)$ is added to each soft clause $S_j$. Solving the Partial MaxSAT problem for $\phi$ is reduced to minimize the number of satisfied blocking variables in $\phi' = \{H_1, \ldots, H_m, S_1 \vee b_1, \ldots, S_n \vee b_n\}$.

A minimal satisfying assignment can readily be found by iterative call to MiniSat. First run MiniSat on $\phi'$ to get an initial assignment. If there is no such assignment, we conclude that $\phi$ is unsatisfiable. If such an assigment is found, we count the number of satisfied blocking variables in the assignment. Let $k$ be the number. We make a cardinality constraint $\Sigma_{j=1}^{n} b_j < k$. Let $CNF(\Sigma_{j=1}^{n} b_j < k)$ be a CNF encoding of the constraint. We add $CNF(\Sigma_{j=1}^{n} b_j < k)$ to $\phi'$ and run again. If the problem is unsatisfiable, $k$ is the optimum solution. If not, the process is repeated with the new smaller solution.

We use the CNF encoding by O. Bailleux and Y. Boufkhad [2].

# References

[1] Niklas Eén and Niklas Sörensson. An Extensible SAT-sover. In Proc. of SAT 2004, pp.333-336, 2004.

[2] Olivier Bailleux and Yacine Boufkhad. Efficient CNF Encoding of Boolean Cardinality Constraints. In Proc. of CP 2003, pp.108-122, 2003.

[1] Kyushu University is called "Kyushu Daigaku" or "Q-dai" in Japanese.