

NaPS: Nagoya pseudo-Boolean solver

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1 Introduction

NaPS (Nagoya pseudo-Boolean solver) [7] is a pseudo-Boolean solver branched from MiniSAT+ version 1.0 [5]. NaPS accepts the DIMACS PB instances for PB competitions that contain no non-linear constraints. The extended features of the NaPS input language are listed as follows:

- Negated Boolean variables: negations $\sim x$ of variables x are allowed in constraints.
- Each constraint may include an implication: constraints are in the following form:

d literal implication-operator linear-constraint ;

where $\Rightarrow$, $\Leftarrow$, and $\Leftrightarrow$ are allowed as an *implication-operator*.

NaPS optionally accepts the DIMACS format for CNF/WCNF and features a MaxSat mode. It has a (possibly projected) model-counting facility.

2 Techniques

2.1 NaPS

NaPS is version 1.04, which fixes some bugs in version 1.03a6 submitted to the PB'25 competition. Moreover, it incorporates SCIP used as (1) a presolver and (2) an interleaving executor with a SAT solver when in optimization mode, exchanging fixed variables and upper/lower bound values.

The solver transforms PB-instances to ordinary Boolean SAT-instances mainly via reduced ordered BDDs with two-clause coding [1]. It sometimes preprocesses coefficients by a multi-based decomposition [4]. It constructs a single BDD for each PB constraint using an equation in [7]. In optimization, it adopts an alternative strategy [7], which combines sequential and binary strategies, where the latter has a ratio of 1 : 2.

It uses the following underlying SAT solvers:

- Kissat [2] version 4.0.4 for decision problems, and
- CaDiCaL [2] version 3.0.0 for others by default.

2.2 Scip-NaPS

Scip-NaPS version 1.00a2, the same version as submitted to PB24, is a combination solver that first attempts to solve using SCIP [3] and then NaPS. For optimization problems, NaPS receives a feasible objective interval and a partial variable assignment fixed by SCIP, enabling NaPS to operate on a simplified instance.

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