Yices-ismt for SMT COMP 2022

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1 Overview

We propose a wrapper solver Yices-ismt for QF_NIA that combines Yices2 [1] and ismt, where Yices2 is the winner solver of QF_NIA of UNSAT performance in SMT-COMP 2021. The solver ismt is our experimental SMT solver, composed of a parser, a preprocessor, and a theory solver. The preprocessor performs a sequence of calls to formula rewriters. The theory solver mainly consists of four parts: collector, decider, searcher, and resolver. In addition, ismt implements optional algorithm plugins invoked in the theory solver, such as bit-blasting, interval arithmetic, etc.

2 Dependencies

For completeness, Yices-ismt invokes the SMT solver Yices 2.6.2 as a sub-solver. Rewriters and algorithms related to polynomial and interval are implemented on the libpoly library v0.1.11 [2]. The back-end SAT solver of the bit-blasting algorithm is from CaDiCal 1.5.2 [3].

3 Implementation

Ismt. Currently, ismt only supports QF_NIA. The decider assigns each integer variable an interval while checking consistency via interval arithmetic and resolving conflicts via re-assigning. For example, the interval assignment $x \to [0,1], y \to [0,1]$ conflicts with constraint $y = x + 2$ and then ismt re-assigns $y \to [0,3]$ before searching. In addition, we propose a series of bit-width decision heuristics. After all variables are (partially or) completely decided, the searcher attempts to find a model in the space via the bit-blasting method [4].
Yices-ismt. Assume that the original SMT formula is ϕ, ismt searches in a finite space $F = \bigotimes_{x \in V} I(x)$, where V is the set of variables and $I(x) = l_x \leq x \leq u_x$ is the interval constraint for variable x. If ismt has not found a model in F, the

combined solver Yices-ismt will generate a lemma ψ to rule out the space where $\psi = \bigvee_{x \in V} \neg I(x)$. Otherwise if ismt runs out of resources during searching, $\psi = \top$. We implement the solver Yices-ismt with portion of time bound allocation $\{0.1, 0.8, 0.1\}$ for sequential execution of $\{\text{Yices2}(\phi), \text{ismt}(\phi), \text{Yices2}(\phi \wedge \psi)\}$. If the first two end earlier, then $\text{Yices2}(\phi \wedge \psi)$ runs within the remaining time. Yices-ismt returns $\{sat, unsat\}$ once Yices2 or ismt results $\{sat, unsat\}$, and *unknown* when the time budget is exhausted.

References

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