STP-CNFLS at SMT-COMP 2024

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1 Introduction

STP-CNFLS is a derived SMT solver based on based on STP [2] (commit SHA 0510509). It participates in the Single Query of QF_BV logics. This solver translates SMT formulas into word-level CNF and leverages a CNF-based local search strategy. This strategy is inspired by advancements in local search algorithms for QF_NIA [1], enhancing its capability to efficiently handle Boolean vector operations.

2 Features

The primary workflow of our solver is structured as follows:

1. **Pre-Bit-Blasting Formula Simplification:** Apply STP's existing formula simplification techniques to streamline the formula prior to bit-blasting.
2. **Conversion to Word-Level CNF:** Transform the simplified formula into a word-level Conjunctive Normal Form (CNF).
3. **Word-Level Local Search:** Implement a word-level local search strategy similar to the approach used for QF_NIA. The key difference is that during each step of the local search, if a variable's value needs to be altered to satisfy a clause, bitblasting is performed on the associated terms. Subsequently, a SAT solver is employed to ascertain the new value of the variable. During this process, all variables except the target variable are held constant at their current assignments.
4. **Fallback to Bit-Blasting:** In cases where the local search fails to find a solution, the system defaults to STP's traditional bit-blasting method followed by resolution through a SAT solver.

3 Webpage

Further information can be found at
https://github.com/jkunlin/STP_CNFLS

References

1. Cai, S., Li, B., Zhang, X.: Local search for satisfiability modulo integer arithmetic theories. ACM Transactions on Computational Logic **24**(4), 1–26 (2023)
2. Ganesh, V., Dill, D.L.: A decision procedure for bit-vectors and arrays. In: Computer Aided Verification: 19th International Conference, CAV 2007, Berlin, Germany, July 3-7, 2007. Proceedings 19. pp. 519–531. Springer (2007)