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CNF Clause Trimming with Gröbner Bases via Term Ordering

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Abstract

This project proposes a CNF SAT transformation algorithm employing a partitioning technique followed by efficient monomial ordering, polynomial to CNF conversion, and finally, run through a SAT solver engine. Gröbner bases as a means to analyze the problem structure.

1. Introduction (include previous work)

The Boolean Satisfiability (SAT) has become a key tool in formal circuit design and verification. Using a SAT solver can find solutions that satisfy a set of Boolean equations (SAT) or determine that there are no solutions that exist (UNSAT). Representing existing and optimized solutions in Conjunctive Normal Form (CNF) equivalence can be checked by finding solutions to literal-disjunctions (clauses) through a variable assignment.

In practice heuristical SAT-solvers can solve many problems rather efficiently; however, this is not true for all SAT problems. Many problems are not efficiently solved by SAT. Since SAT beginnings [1] techniques such as pruning [2] and clause learning [3] have increased their efficiency and success.

Solving for SAT-problems involves SAT-solvers. Most are based on the Davis-Putnam [1] and Davis-Logemann-Loveland [2] procedures (DPLL), which performs recursive branching and unit propagation over clauses. This technique is aided by concepts such as constraint-propagation [3], conflict analysis [4], and learning [5], which enable non-chronological backtracking [4] [6] [7], pruning the search space and reducing overall search time.

1. Previous Work
2. Theory
3. Algorithm Implintation (CNF to Graph, Partitioning, Graph to Poly, Ordering, Ply to CNF, Sat)
4. Results
5. Conclusion
6. Bibliography

[1] M. Davis and H. Putnam. A computing procedure for quantification theory.

CACM, 7:201–215, 1960.

[2] M. Davis, G. Logemann, and D. Loveland. A machine program for theorem

proving. CACM, 5:394–397, 1962.

[3] P. Beame, H. Kautz, and A. Sabharwal. Understanding and harnessing the

potential of clause learning. JAIR, 22:319–351, Dec. 2004.