Design of a Parallel Look-ahead SAT Solver using Strategy Set

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Abstract

Propositional satisfiability is the problem of determining, for a formula of the propositional logic, if there is an assignment of truth values to its variables for which that formula evaluates to true. SAT is one of the most-researched NP-complete problems in several fields of computer science, including theoretical computer science, artificial intelligence, hardware design, and formal verification. By SAT we mean the problem of propositional satisfiability for formulas in conjunctive normal form (CNF). Modern sequential SAT solvers are based on the Davis-Putnam-Logemann-Loveland (DPLL) algorithm. We focused the look-ahead SAT solvers. This solvers are based on branching. They create two branches, on the first they propagate a pozitiv literal, on the other one the negation of this literal. Both branches results in a smaller SAT problem. These can be calculated in a parallel way, but for these we need only two clients, which means that we cannot utilize our GRID.

In this paper we present a parallel look-ahead SAT solver. Our idea is to make more branches. We use so called strategy sets, sets which tell us, which literals to propagate on each branch. A strategy set is a set of assignments. It must be unsatisfiable. The smallest strategy set is $\{\{lit\}, \{\neg lit\}\}$, where lit is a literal. This is used by march_cc. In this paper we uses strategy sets which have the form: $\{\{lit_1, lit_2, \ldots, lit_n\}, \{\neg lit_1, \neg lit_2, \ldots, \neg lit_n\}\}$. We also have experiences kind of strategy set. Our strategy was to split the initial SAT problem into smaller ones by a look-ahead SAT solver, called march_cc. We learned that there is no parallel look-ahead SAT solver upto our knowledge.

Keywords: parallel look-ahead SAT solver, strategy set
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