SatHYS: Sat Hybrid Solver

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Abstract. This note describes features of the version of SATHYS that entered the SAT-race 2010 affiliated to the SAT'2010 conference in Edinburgh, Scotland, UK.

1 Overview

SATHYS (*Sat Hybrid Solver*) is a new hybridization of local search and modern SAT solver. In our approach, both components heavily cooperate through relevant information gathered during search. More precisely, our hybrid solver alternatively performs the search process using local search and CDCL based SAT solvers. On the one hand, at each node of the search tree, the local search component is used to extend to the model, the current (consistent) partial assignment built by the CDCL based component. On the other hand, the CDCL part is conditionally invoked by the local search component when a local minima is encountered. Each solver benefits from the other in several ways. First, each time a local minima is reached, the local search technique update the activity of the boundary variables [4]. The idea is to direct the CDCL search towards boundary points proven to be important by Goldberg in [4]. Secondly, the polarities of the literals involved in the best complete assignment found during local search are exploited by the CDCL component. From the other side, the CDCL solver shares with local search the current partial assignment together with the learnt clauses. The originality of our proposed hybrid SAT solver arises in alternating search of both components while exchanging relevant information.

The CDCL part includes all the modern enhancements of the DPLL procedure as they can be found in solvers such as RSAT [7] and MINISAT [2]. These enhancements include watched literal to the unit propagation, first-UIP learning scheme, frequent restarts (Luby strategy [5]), activity-based decision heuristics (VSIDS), and the phase learning policy is used [7]. The main improvement consists in storing the binary clauses in an adjacency list, and in reducing the learnt clauses . These learnt clauses are reduced by resolution with the binary clauses. For reducing learnt clauses database, clauses are sorted by using the phase. This step allows to associate a weight with each clause. This weight is the number of falsified literals. Once the clauses are sorted, half of them are kept.

The local search part includes the watched literal speedup [3] and the metaheuristic used is Rnovelty [6].

For not too large instances, we use SatElite as a pre-processor [1].

2 Code

The system is written in C and has about 4000 lines of code. It was submitted to the race as a 64 bit binary. It is written from scratch.

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