

CleanMaple

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Abstract—This document describes the SAT Solver CleanMaple, which is a refactored version of the SAT Competition 2018 winner Maple_LCM_Dist_ChronoBT [1].

Index Terms—SAT, refactoring, CDCL

I. Overview

The complex nature of the CDCL algorithm and the necessity of high performance implementations encourages a tight coupling of most subroutines and data structures in the source code. However the basic ideas on which CDCL algorithms are based are simple when contrasted to their implementation in Maple_LCM_Dist_ChronoBT. Most parts of the solver Maple_LCM_Dist_ChronoBT are included in one huge monolithic class and many of its methods are themselves massive, having more than 50, 100 or even 150 lines of dense code, resulting in a single source file for this class of almost 2000 lines of code. This design choice as well as most code of the solver can be traced back to the solver Minisat [2] [3] from which Maple_LCM_Dist_ChronoBT evolved over a time span of more than ten years with ideas and contributions from many different authors, most notably by the authors of [4], [5], [6], [7], [8] and [9]. The rather complicated code base leads to a steep learning curve for researchers that wish to develop SAT Solvers based on this state-of-the-art solver.

II. Description

In CleanMaple the two main subroutines

- Unit Propagation and
- the heuristic-based Branching,

and the three main data structures

- the clause database containing all original and learned clauses,
- the variable database containing the three-valued truth-value with respect to the current assignment and the polarities of all variables and
- the implication graph, i.e. the trail, used for fast conflict analysis

have been decoupled from the actual class. This leads to a solver that is much easier to understand. Furthermore, due to the refactoring the size of the binary of the solver was reduced significantly.

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