

SMT-RAT 2.0

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SMT-RAT is an open-source C++ toolbox for strategic and parallel SMT solving consisting of a collection of SMT compliant implementations of methods for solving quantifier-free (non)linear real and integer arithmetic as well as the logics of bit-vectors and uninterpreted functions. A more detailed description of SMT-RAT can be found at <https://github.com/smtrat/smtrat/wiki>.

Main solving procedures The SAT solving within SMT-RAT takes place in an adaption of the SAT solver `minisat` [3] and we use it for SMT solving in a less-lazy fashion [7].

The main focus of SMT-RAT is nonlinear arithmetic. For the linear constraints we use the Simplex method equipped with (currently very naively implemented) branch-and-bound and cutting-plane procedures as presented in [2]. For the nonlinear constraints SMT-RAT uses Gröbner bases [5], virtual substitution [1] and the cylindrical algebraic decomposition [6]. Moreover, it uses interval constraint propagation similar as presented in [4], lifting splitting decisions and contraction lemmas to the SAT solving and aided by the aforementioned approaches for nonlinear constraints in case it cannot determine whether a box contains a solution or not. Furthermore, we apply some naive preprocessing, (1) using factorizations and sum-of-square decompositions of polynomials to simplify them and (2) applying substitutions gained by constraints being equations. We also normalize and simplify formulas if it is obvious.

Authors

- Erika Ábrahám
- Florian Corzilius
- Gereon Kremer
- Sebastian Junges
- Stefan Schupp

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