

# SMT-RAT 2.1

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SMT-RAT [2] 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` [4] and we use it for SMT solving in a less-lazy fashion [8].

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 [3]. For the nonlinear constraints SMT-RAT uses virtual substitution [1] and the cylindrical algebraic decomposition [7]. Moreover, it uses interval constraint propagation similar as presented in [5], 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. For nonlinear integer problems, we employ bit blasting up to some fixed number of bits and use branch-and-bound [6] afterwards. 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

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## References

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