raSAT: SMT for Polynomial Inequality (extended abstract)

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Abstract

This paper presents an iterative approximation refinement, called raSATloop, which solves a system of polynomial inequalities on real numbers. The approximation scheme consists of interval arithmetic (over-approximation, aiming to decide UNSAT) and testing (under-approximation, aiming to decide SAT). If both of them fail to decide, input intervals are refined by decomposition, a refinement step in raSATloop.

The SMT solver raSAT implements the raSATloop, on top of the miniSAT 2.2, with backend theories in Ocaml. The raSATloop is not only a simple framework, but also allows us to design mutually refining strategies, e.g., the result of interval arithmetic refines both test data generation and next refinements, and the result of testing refines next refinements. We discuss three strategy design choices: *dependency* to set priority among atomic polynomial constraints, *sensitivity* to set priority among variables, and *UNSAT core* for reducing learned clauses and incremental UNSAT detection.

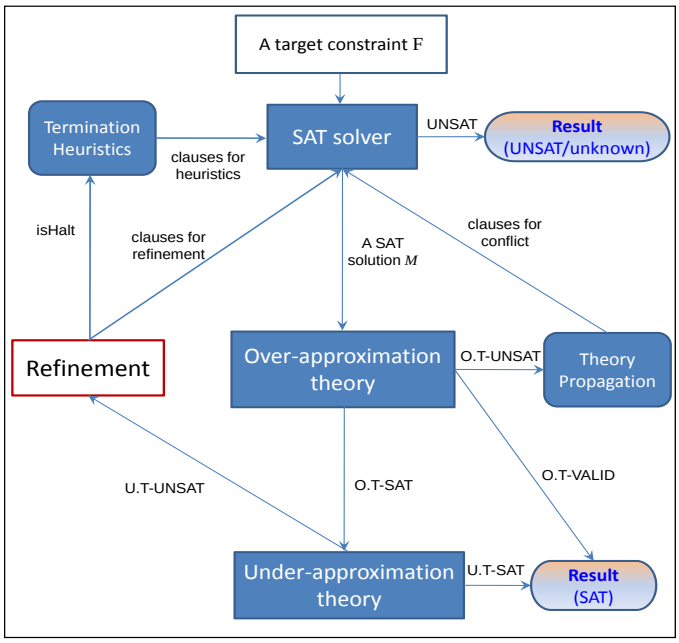

Figure 1: raSATloop