A Fast SAT Solver for Isabelle in Standard ML

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Abstract

This contribution contains a fast SAT solver for Isabelle written in Standard ML. By loading the theory DPT_SAT_Solver, the SAT solver installs itself (under the name “dptsat”) and certain Isabelle tools like Refute will start using it automatically. This is a port of the DPT (Decision Procedure Toolkit) SAT Solver written in OCaml. Theory DPT_SAT_Tests tests the solver on a few hundred problems.

Contents

theory DPT_SAT_Solver
imports Main
begin
ML_file ⟨dpt_sat_solver.ML⟩
end

theory DPT_SAT_Tests
imports DPT_SAT_Solver
begin
ML ⟨
val path = File.tmp_path (Path.explode "sat.out")
val max_secs = 60
(*
val _ = File.write path ""
fun write_out s = (tracing s; File.append path (s ^ "\n"))
*)
val write_out = tracing

fun test name =
  let
    val solver = "dptsat"
    fun aux () =
      let
        val name = "cnf/" ^ name

1
val timer1 = Timer.startRealTimer ()
val formula = SAT_Solver.read_dimacs_cnf_file (master_dir + Path.explode name)
val timer2 = Timer.startRealTimer ()
val res = SAT_Solver.invoke_solver solver formula
val code = case res of
  SAT_Solver.SATISFIABLE _ => "SAT"
| SAT_Solver.UNSATISFIABLE _ => "UNSAT"
| SAT_Solver.UNKNOWN => "UNKNOWN"
fun show_time timer =
  signed_string_of_int (Time.toMilliseconds (Timer.checkRealTimer timer1)) ^ "ms"
in
  write_out (solver ^ ":" ^ name ^ ": " ^ code ^ ": " ^ show_time timer2); code
end
handle Timeout.TIMEOUT _ => (write_out (solver ^ ":" ^ name ^ ": TIMEOUT")); "UNKNOWN")
in
fun sat name = (test name = "SAT" orelse error "Expected SAT")
fun unsat name = (test name = "UNSAT" orelse error "Expected UNSAT")

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