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DP lower bounds for equivalence-checking and model-checking of one-counter automata. (English) Zbl 1078.68087

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Summary: We present a general method for proving DP-hardness of problems related to formal verification of one-counter automata. For this we show a reduction of the SAT-UNSAT problem to the truth problem for a fragment of (Presburger) arithmetic. The fragment contains only special formulas with one free variable, and is particularly apt for transforming to simulation-like equivalences on one-counter automata. In this way we show that the membership problem for any relation subsuming bisimilarity and subsumed by simulation preorder is DP-hard (even) for one-counter nets (where the counter cannot be tested for zero). We also show DP-hardness for deciding simulation between one-counter automata and finite-state systems (in both directions), and for the model-checking problem with one-counter nets and the branching-time temporal logic EF.

MSC:

68Q45 Formal languages and automata
68Q60 Specification and verification (program logics, model checking, etc.)

Keywords:

One-counter machines; Equivalence-checking; Model-checking

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