

Finkel, Alain; Praveen, M.

Verification of flat FIFO systems. (English) Zbl 07269251

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Summary: The decidability and complexity of reachability problems and model-checking for flat counter machines have been explored in detail. However, only few results are known for flat (lossy) FIFO machines, only in some particular cases (a single loop or a single bounded expression). We prove, by establishing reductions between properties, and by reducing SAT to a subset of these properties that many verification problems like reachability, non-termination, unboundedness are NP-complete for flat FIFO machines, generalizing similar existing results for flat counter machines. We also show that reachability is NP-complete for flat lossy FIFO machines and for flat front-lossy FIFO machines. We construct a trace-flattable system of many counter machines communicating via rendez-vous that is bisimilar to a given flat FIFO machine, which allows to model-check the original flat FIFO machine. Our results lay the theoretical foundations and open the way to build a verification tool for (general) FIFO machines based on analysis of flat sub-machines.

MSC:

03B70 Logic in computer science

68 Computer science

Keywords:

infinite state machines; FIFO; counters; flat machines; reachability; termination; complexity

Software:

FAST ; FLATA; TREX

Full Text: [Link](#) [arXiv](#)

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