

Limaye, Nutan; Mahajan, Meena; Meyer, Antoine

On the complexity of membership and counting in height-deterministic pushdown automata.

(English) [Zbl 1142.68424](#)

Hirsch, Edward A. (ed.) et al., Computer science – theory and applications. Third international computer science symposium in Russia, CSR 2008 Moscow, Russia, June 7–12, 2008. Proceedings. Berlin: Springer (ISBN 978-3-540-79708-1/pbk). Lecture Notes in Computer Science 5010, 240-251 (2008).

Summary: While visibly pushdown languages properly generalise regular languages and are properly contained in deterministic context-free languages, the complexity of their membership problem is equivalent to that of regular languages. However, the corresponding counting problem could be harder than counting paths in a non-deterministic finite automaton: it is only known to be in LogDCFL.

We investigate the membership and counting problems for generalisations of visibly pushdown automata, defined using the notion of height-determinism. We show that, when the stack-height of a given PDA can be computed using a finite transducer, both problems have the same complexity as for visibly pushdown languages. We also show that when allowing pushdown transducers instead of finite-state ones, both problems become LogDCFL-complete; this uses the fact that pushdown transducers are sufficient to compute the stack heights of all real-time height-deterministic pushdown automata, and yields a candidate arithmetization of LogDCFL that is no harder than LogDCFL (our main result).

For the entire collection see [[Zbl 1136.68005](#)].

MSC:

[68Q45](#) Formal languages and automata

[68Q15](#) Complexity classes (hierarchies, relations among complexity classes, etc.)

[68Q25](#) Analysis of algorithms and problem complexity

Cited in **3** Documents

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