A Reduction of Finitely Expandable Deep Pushdown Automata

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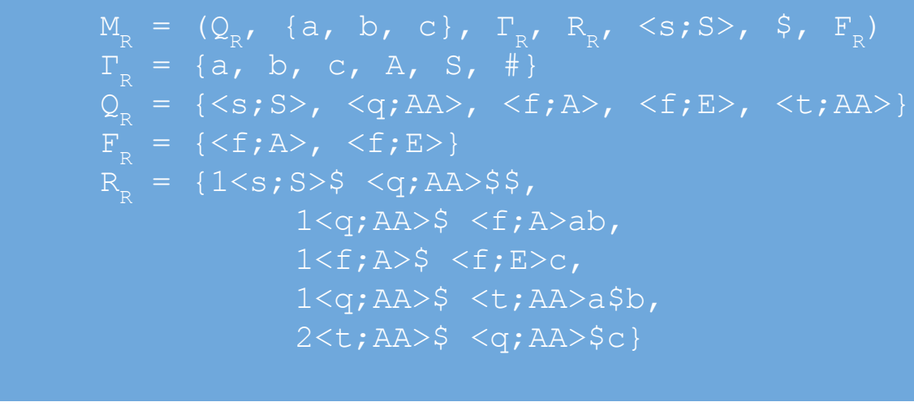
Introduction

For a positive integer n, n-expandable deep pushdown automata always contain no more than n occurrences of non-input symbols in their pushdowns during any computation. As its main result, the present paper demonstrates that these automata are as powerful as the same automata with only two non-input pushdown symbols $ and #, where # always appears solely as the pushdown bottom.

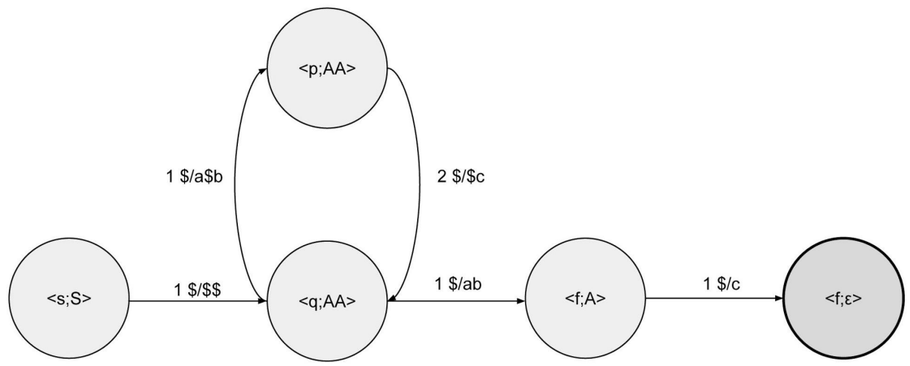
Construction

States in Q_R include not only the states corresponding to the states in Q but also strings of non-input symbols. Whenever M pushes a non-input symbol onto the pushdown, M_R records this information within its current state and pushes $ onto the pushdown instead.

```
M = ({s, q, t}, {a, b, c},
      Γ, R, s, S, {f})
Γ = {a, b, c, A, S, #}
R = {1sS qAA,
     1qA fab,
     1fA fc,
     1qA taAb,
     2tA qAc}
```



```
M_R = (Q_R, {a, b, c}, Γ_R, R_R, <s;S>, $, F_R)
Γ_R = {a, b, c, A, S, #}
Q_R = {<s;S>, <q;AA>, <f;A>, <f;E>, <t;AA>}
F_R = {<f;A>, <f;E>}
R_R = {1<s;S>$ <q;AA>$$,
       1<q;AA>$ <f;A>ab,
       1<f;A>$ <f;E>c,
       1<q;AA>$ <t;AA>a$b,
       2<t;AA>$ <q;AA>$c}
```



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