Parsing

Homework 10 (Tomita), due 29 June 2020

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Question 1 (Tomita graph-based stack)

Consider the CFG $\langle N, T, P, S\rangle$ with

$N = \{S\}$, $T = \{a, c\}$, start symbol S, and productions $1.S \to aSc$, $2.S \to aS$, $3.S \to \varepsilon$.

The LR(1) parse table is as follows:

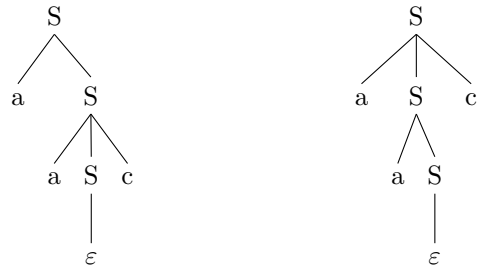
	a	*c*	$	*S*
0	*s2*		*r3*	*1*
1			*acc*	
2	*s3*	*r3*	*r3*	*4*
3	*s3*	*r3*	*r3*	*6*
4		*s5*	*r2*	
5			*r1*	
6		*s7, r2*	*r2*	
7		*r1*	*r1*	

1. *Give the two parse trees for aac with this grammar.*
2. *Give the graph corresponding to the compact parse forest representation for the input aac with this grammar.*
3. *Give the trace of the Tomita-parse for aac (with all intermediate stack graphs and all analyses), using the compact parse forest representation.*

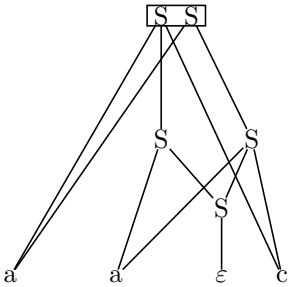
Note that the grammar has a ε-production. Reducing with this is possible (according to the parse table) when being in state 3 or 4 and havign c or $ as next input symbol. This reduce means creating an S node with a single daughter, labeled ε (notation $S(\varepsilon)$) and pushing the pointer to this S-node onto the stack.

Solution:

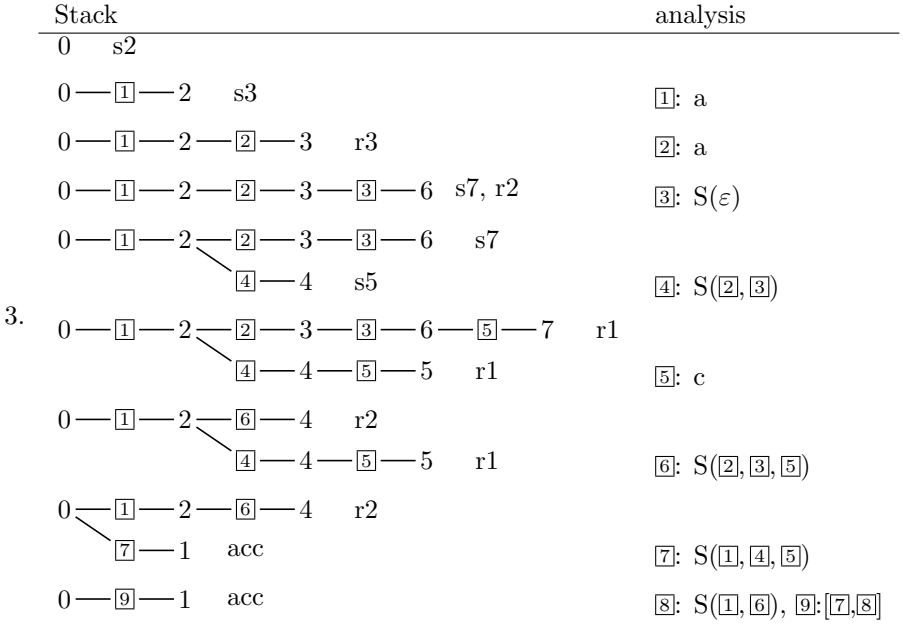
1.



2.



3.


Stack
analysis
0 s2
0 — 1 — 2 s3
1: a
0 — 1 — 2 — 2 — 3 r3
2: a
0 — 1 — 2 — 2 — 3 — 3 — 6 s7, r2
3: S(ε)
0 — 1 — 2 — 2 — 3 — 3 — 6 s7
4 — 4 s5
4: S(2, 3)
0 — 1 — 2 — 2 — 3 — 3 — 6 — 5 — 7 r1
4 — 4 — 5 — 5 r1
5: c
0 — 1 — 2 — 6 — 4 r2
4 — 4 — 5 — 5 r1
6: S(2, 3, 5)
0 — 1 — 2 — 6 — 4 r2
7 — 1 acc
7: S(1, 4, 5)
0 — 9 — 1 acc
8: S(1, 6), 9:[7,8]