

Parsing

Homework 8 (Left corner, Earley), due 15 June 2020

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Question 1 (Left Corner Parsing)

Consider the CFG G with non-terminals $N = \{S\}$, terminals $T = \{a, b\}$, start symbol S and productions $S \rightarrow aSa \mid Sb \mid b$.

Given an input word aba , give the Left Corner Recognition trace, i.e. the set of stack triples, for this input. Indicate for each triple the operation that has lead to it together with the number of the antecedent triple and, in case of reduce, the predicted production.

Solution:

	Γ_{compl}	Γ_{td}	Γ_{lhs}	operation
1.	aba	S	-	
2.	ba	Sa\$\$	S	reduce from 1., $S \rightarrow aSa$
3.	a	\$\$Sa\$\$	SS	reduce from 2., $S \rightarrow b$
4.	Sa	Sa\$\$	S	move from 3.
5.	a	a\$\$	S	remove from 4.
6.	a	b\$\$Sa\$\$	SS	reduce from 4., $S \rightarrow Sb$
7.	-	\$\$	S	remove from 5.
8.	-	Sa\$b\$\$Sa\$\$	SSS	reduce from 6., $S \rightarrow aSa$
9.	S	S	-	move from 7.
10.	-	-	-	remove from 9.

Question 2 (Earley Parsing)

Consider the CFG $\langle N, T, P, S \rangle$ with $N = \{S\}$, $T = \{a\}$, $P = \{S \rightarrow SS, S \rightarrow a, S \rightarrow \varepsilon\}$

1. Give the chart resulting from an Earley-recognition of aa using the algorithm from slides 6–8.
2. How many parse trees does the input “ aa ” have with this grammar?

Solution:

			$S \rightarrow SS\bullet$ $S \rightarrow S\bullet S$ $S \rightarrow \bullet SS$
2	$S \rightarrow S\bullet S$ $S \rightarrow SS\bullet$	$S \rightarrow SS\bullet$ $S \rightarrow S\bullet S$ $S \rightarrow a\bullet$	$S \rightarrow \bullet SS$ $S \rightarrow \bullet a$ $S \rightarrow \bullet$
1.		$S \rightarrow SS\bullet$ $S \rightarrow S\bullet S$	
1	$S \rightarrow SS\bullet$ $S \rightarrow S\bullet S$ $S \rightarrow a\bullet$	$S \rightarrow \bullet SS$ $S \rightarrow \bullet a$ $S \rightarrow \bullet$	
0	$S \rightarrow SS\bullet$ $S \rightarrow S\bullet S$ $S \rightarrow \bullet SS$ $S \rightarrow \bullet a$ $S \rightarrow \bullet$		
	0	1	2

2. Infinitely many.