Parsing

Homework 5 (CYK, Shift Reduce), due 02 June 2020 (Tuesday)

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Question 1 (CYK with dotted productions)

Consider the CFG with non-terminals S, T, C, terminals a, b, c, start symbol S and productions $S \to aT \mid abC$, $T \to bC$, $C \to c$.

Give the chart (the $(n+1) \times (n+1)$-table) that results from CYK parsing with dotted productions for the input $w = abc$ using

1. *the deduction rules from slide 30 (CYK slides)*
2. *the deduction rules from slide 31 (left-corner prediction, CYK slides)*

Keep in mind that these items use start and end indices for spans, not start index and length (in this respect, the ex. on slide 32 is actually wrong).

Solution:

1.

	3	$S \to abC\bullet$, $S \to aT\bullet$	$T \to bC\bullet$	$C \to c\bullet$	$S \to \bullet aT$, $S \to \bullet abC$ $T \to \bullet bC$, $C \to \bullet c$
	2	$S \to ab \bullet C$	$T \to b \bullet C$	$S \to \bullet aT$, $S \to \bullet abC$ $T \to \bullet bC$, $C \to \bullet c$	
	1	$S \to a \bullet T$, $S \to a \bullet bC$	$S \to \bullet aT$, $S \to \bullet abC$ $T \to \bullet bC$, $C \to \bullet c$		
	0	$S \to \bullet aT$, $S \to \bullet abC$ $T \to \bullet bC$, $C \to \bullet c$			
		0	1	2	3

2.

	3	$S \to abC\bullet$, $S \to aT\bullet$, S	$T \to bC\bullet$, T	c, $C \to c\bullet$, C	
	2	$S \to ab \bullet C$	b, $T \to b \bullet C$		
	1	a, $S \to a \bullet T$, $S \to a \bullet bC$			
	0				
		0	1	2	3

Question 2 (Shift reduce parsing)

Consider the same CFG and the same input ($w = abc$) as in the preceding exercise.

1. *Perform a shift-reduce parsing for this input. List the different parser configurations in a table as follows:*

stack	*remaining input*	*production (in case of reduce)*
ε	abc	–
a	bc	–

***All** possibilities must be listed.*

2. *Explain why shift reduce parsing for this grammar is not deterministic. More concretely, at which point do we encounter a reduce-reduce conflict?*

Solution:

1.

stack	remaining input	production (in case of reduce)
ε	abc	–
a	bc	–
ab	c	–
abc	ε	–
abC	ε	$C \to c$
aT	ε	$T \to bC$
S	ε	$S \to aT$, $S \to abC$

2. The configuration $abC \quad \varepsilon$ allows for two different reduce options, either with $T \to bC$ or with $S \to abC$.