Parsing Beyond CFG
Homework 11: LCFRS 4

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Question 1 *Consider the ordered simple RCG with the following rules:*

$S(XYZ) \to A(X,Z)B(Y)$ $B(e) \to \varepsilon$
$A(aX, aY) \to A(X,Y)$ $A(c,c) \to \varepsilon$
$A(Xb, Yb) \to A(X,Y)$

Give all items that are deduced when parsing $w = cbecb$ with the incremental Earley Parser described in the course.

Solution:

id	rule	pos	bindings	operation
1	$S(\bullet XYZ) \to A(X,Z)B(Y)$	0	?,?,?	axiom
2	$A(\bullet aX, aY) \to A(X,Y)$	0	?,?,?,?	predict(1)
3	$A(\bullet c, c) \to \varepsilon$	0	?,?	predict(1)
4	$A(\bullet Xb, Yb) \to A(X,Y)$	0	?,?,?,?	predict(1)
5	$A(c\bullet, c) \to \varepsilon$	1	$\langle 0,1 \rangle$,?	scan(3)
6	$S(X \bullet YZ) \to A(X,Z)B(Y)$	1	$\langle 0,1 \rangle$,?,?	suspend(1,5)
7	$A(X \bullet b, Yb) \to A(X,Y)$	1	$\langle 0,1 \rangle$,?,?,?	suspend(4,5)
8	$B(\bullet e) \to \varepsilon$	1	?	predict(6)
9	$A(Xb\bullet, Yb) \to A(X,Y)$	2	$\langle 0,1 \rangle$,$\langle 1,2 \rangle$,?,?	scan(7)
10	$S(X \bullet YZ) \to A(X,Z)B(Y)$	2	$\langle 0,2 \rangle$,?,?	suspend(1,9)
11	$A(X \bullet b, Yb) \to A(X,Y)$	2	$\langle 0,2 \rangle$,?,?,?	suspend(4,9)
12	$B(\bullet e) \to \varepsilon$	2	?	predict(10)
13	$B(e\bullet) \to \varepsilon$	3	$\langle 2,3 \rangle$	scan(12)
14	$B(\langle 2,3 \rangle)$			convert(13)
15	$S(XY \bullet Z) \to A(X,Z)B(Y)$	2	$\langle 0,2 \rangle$,$\langle 2,3 \rangle$,?	complete(10,14)
16	$A(Xb, \bullet Yb) \to A(X,Y)$	3	$\langle 0,1 \rangle$,$\langle 1,2 \rangle$,?,?	resume(9,15)
17	$A(c, \bullet c) \to \varepsilon$	3	$\langle 0,1 \rangle$,?	resume(5,16)
18	$A(c, c\bullet) \to \varepsilon$	4	$\langle 0,1 \rangle$,$\langle 3,4 \rangle$	scan(17)
19	$A(\langle 0,1 \rangle, \langle 3,4 \rangle)$			convert(18)
20	$A(Xb, Y \bullet b) \to A(X,Y)$	4	$\langle 0,1 \rangle$,$\langle 1,2 \rangle$,$\langle 3,4 \rangle$,?	complete(16,19)
21	$A(Xb, Yb\bullet) \to A(X,Y)$	5	$\langle 0,1 \rangle$,$\langle 1,2 \rangle$,$\langle 3,4 \rangle$,$\langle 4,5 \rangle$	scan(20)
22	$A(\langle 0,2 \rangle, \langle 3,5 \rangle)$			convert(21)
23	$S(XYZ\bullet) \to A(X,Z)B(Y)$	2	$\langle 0,2 \rangle$,$\langle 2,3 \rangle$,$\langle 3,5 \rangle$	complete(15,22)
24	$S(\langle 0,5 \rangle)$			convert(23)