LALR(1) parser

Date 18/10/22

Look Ahead LR(1)

* In LALR(1), find LR(1) items

LR(1) = LR(0) items + Look ahead

- Construction of LALR(1) parsing Table

Step-1 Write the Augmented Grammar.

Step-2 find the LR(1) items

LR(1) = LR(0) + Lookahead.

- Step-3 Defining 2 functions, GoTo(NT) & Action (T).

Step-4. Create Parsing table

Step-5 Check weather string (w) is accepted or not.

Question Construction of LALR(1) parsing table of given grammar. $S \rightarrow AA$, $A \rightarrow aA/b$ And check weather string ($w = aabb$) is accepted or not.

Answer-

$S \rightarrow AA$ — production (1)
$A \rightarrow aA$ — production (2)
$A \rightarrow b$ — production (3)

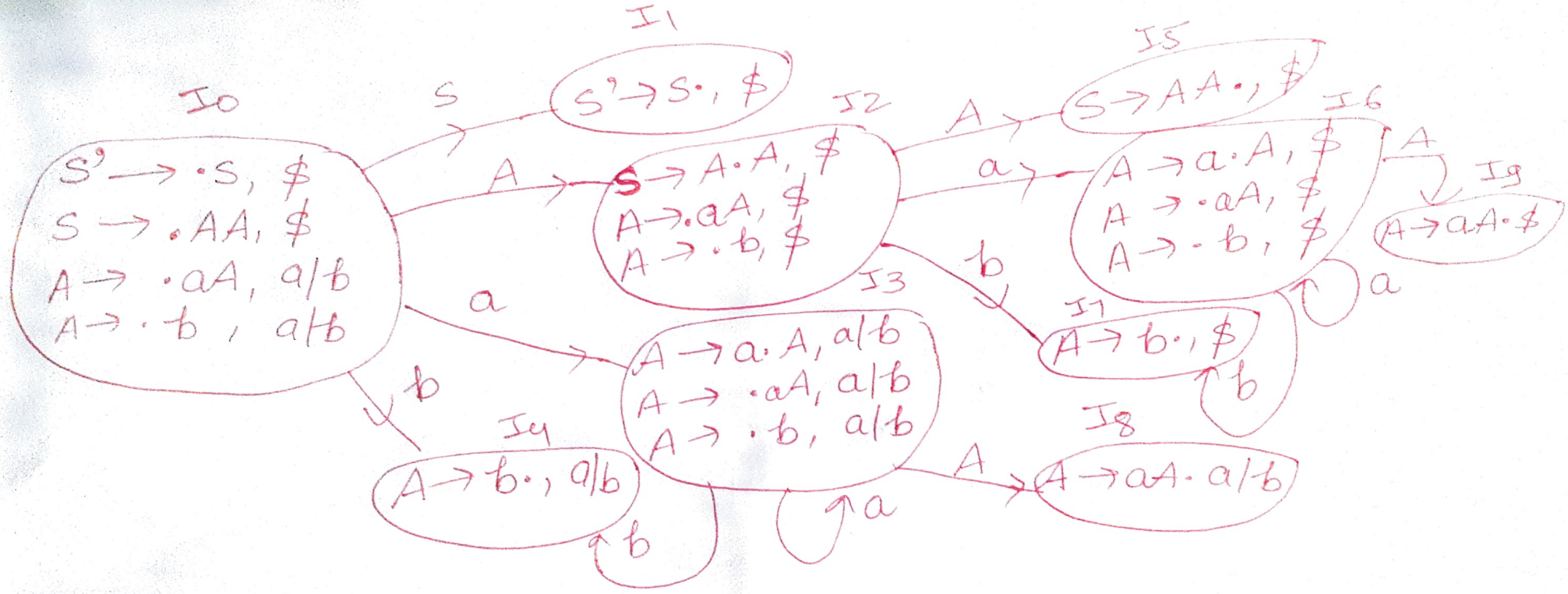
Step-1 Write Augmented Grammar.

$S' \rightarrow S$
$S \rightarrow AA$
$A \rightarrow aA$
$A \rightarrow b$

Step-2 Find the LR(1) items, means

LR(1) = LR(0) + Lookahead

* For Lookahead, we find first() of grammar.



Grammar	first()
S → AA	a, b
A → aA	a
A → b	b

Step-4 Parsing table ~~LALR~~ CLR(1).

State	Action			Goto	
	a	b	$	S	A
0	S_3	S_4		1	2
1			Accepted		
2	S_6	S_7			5
3	S_3	S_4			8
4	R_3	R_3			
5			R_1		
6	S_6	S_7			9
~~7~~			R_3		
8	R_2	R_2			
9			R_2		

* This is a CLR(1) parsing table.
* In LALR(1) we reduce the size ~~the~~ of table. Means reduce states.
* And the state is reduce when the LR(0) ~~same items~~ any state but lookahead is different.
* So, that state will be mearged.

By considering the state's transition diagram

S:85

① I_3, I_6 are same but Lookahead different.

② I_4, I_7 " " " " "

③ I_8, I_9 " " " " "

- so, I_3 & I_6 change by I_{36} in table
  I_4 & I_7 " " I_{47} " "
  I_8 & I_9 " " " " "

State	Action			Goto	
	a	b	$	S	A
0	S_{36}	S_{47}		1	2
1			Acc.		
2	S_{63}	S_{74}			5
36	S_{36}	S_{47}			89
47	R3	R3			
5			R1		
63	S_{63}	S_{74}			
74			R3		
89	R2	R2			
98			R2		

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Finally, LALR(1) Parsing table

State Q	Action			Goto	
	a	b	$	S	A
0	S_{36}	S_{47}		1	2
1			Accepted		
2	S_{36}	S_{47}			5
36	S_{36}	S_{47}			89
47	R3	R3	R3		
5			R1		
89	R2	R2	R2		

Step-5 Check weather string is accepted or not by this.

w = aabb

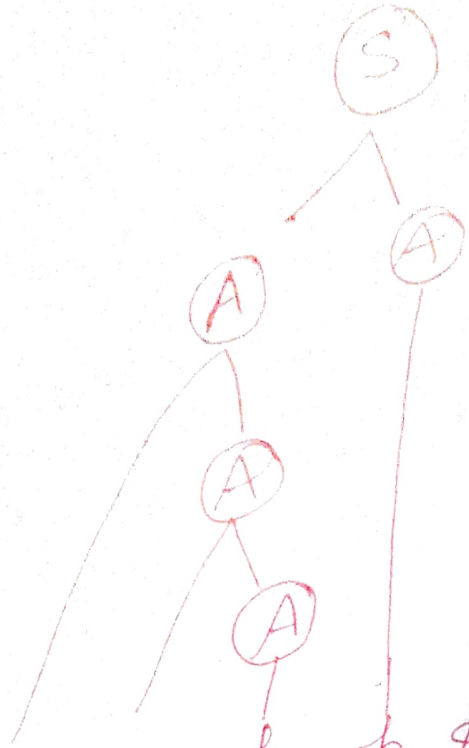
Append $ end the of string

aabb$

$S \rightarrow A\,A$ — (1)

$A \rightarrow a\,A$ — (2)

$A \rightarrow b$



Parser Tree

0	a	3	a	3	b	4	A	8	A	8	A	7	b	4	A	$	S	1

Accepted

Shweta Tiwari