## LR(0) Parser

**Course Name: Compiler Design** 

**Course Code: CSE331** 

Level:3, Term:3

Department of Computer Science and Engineering

**Daffodil International University** 

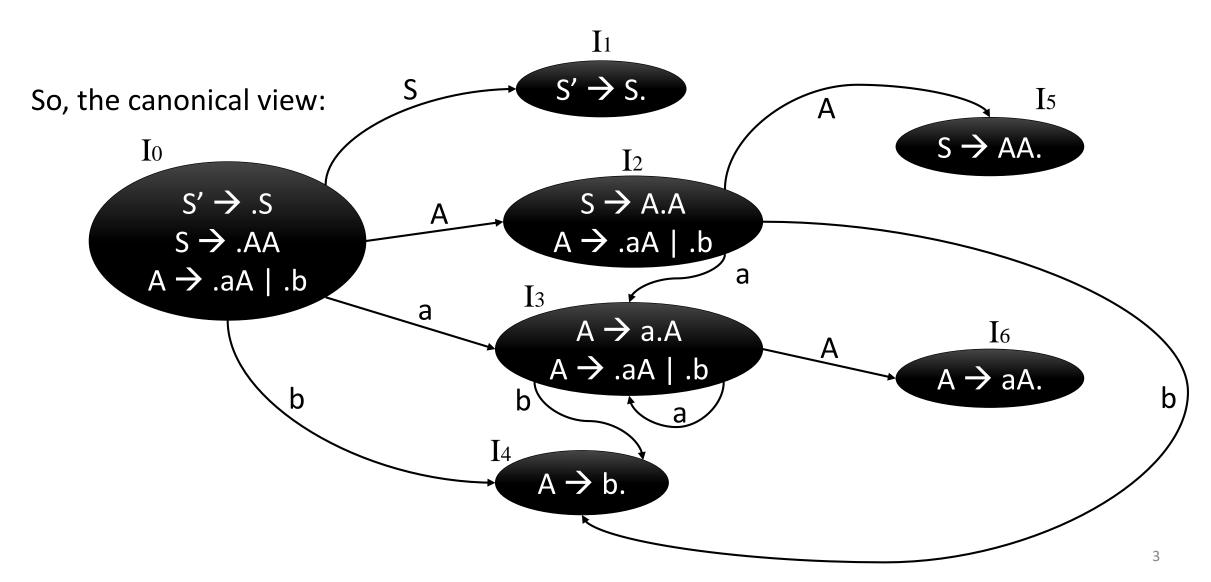
Given That, 
$$S \rightarrow A A$$
  
 $A \rightarrow a A \mid b$ 

We will denote an expression as  $S' \rightarrow .S$ 

$$S \rightarrow .A A$$
  
 $A \rightarrow .a A \mid .b$ 

We will denote an expression as  $S' \rightarrow .S$ 

 $S \rightarrow .A A$  $A \rightarrow .a A \mid .b$ 





A → . a A -----2

A → .b -----3

	S	$I_1$ $S \rightarrow S$ $S' \rightarrow S$ $A \rightarrow AA$ $A \rightarrow A$
ìC	oto	b $A \rightarrow .aA \mid .b$ $A \rightarrow aA$ .
	S	$I_4$ $A \rightarrow b.$
	1	

States	Action			Goto	
States	а	b	\$	Α	S
<b>I</b> o	<b>S</b> 3	<b>S4</b>		2	1
<b>I</b> 1			Accepted		
<b>I</b> 2	S3	S4		5	
<b>I</b> 3	S3	S4		6	
I4	r3	r3	r3		
I <sub>5</sub>	r1	r1	r1		
<b>I</b> 6	r2	r2	r2		

Here we can say,  $S \rightarrow . A A ------1$   $A \rightarrow . a A ------2$  $A \rightarrow .b -----3$ 

Shift (S) = $Si(1,2,3)$
Reduce $(r) = ri(1,2,3)$

	Action			Go	oto
	a	b	\$	Α	S
Io	S3	S4		2	1
<b>I</b> 1			Accepted		
<b>I</b> 2	S3	S4		5	
<b>I</b> 3	S3	S4		6	
<b>I</b> 4	r3	r3	r3		
<b>I</b> 5	r1	r1	r1		
<b>I</b> 6	r2	r2	r2		

Input: a a b b \$

Here we can say,  $S \rightarrow . A A ------1$   $A \rightarrow . a A ------2$  $A \rightarrow .b -----3$ 

Shift (S) = Si $(1,2,3)$
Reduce (r) = $ri(1,2,3)$

	Action			Go	oto
	a	b	\$	Α	S
Io	<b>S3</b>	S4		2	1
<b>I</b> 1			Accepted		
I2	S3	S4		5	
I <sub>3</sub>	S3 <sub> </sub>	S4		6	
I4	r3	r3	r3		
I5	r1	r1	r1		
<b>I</b> 6	r2	r2	r2		

Input: a a b b \$

Here we can say,  $S \rightarrow . A A ------1$   $A \rightarrow . a A ------2$  $A \rightarrow . b ------3$ 

		Acti	Go	oto	
	а	b	\$	Α	S
Io	S3	S4		2	1
<b>I</b> 1			Accepted		
I2	S3	S4		5	
I3	S3	S4		6	
I4	r3	r3	r3		
I5	r1	r1	r1		
<b>I</b> 6	r2	r2	r2		

Shift (S) = Si (1,2,3)	
Reduce (r) = $ri(1,2,3)$	

Input: a a b b \$

Shift (S) = Si(1,2,3)Reduce (r) = ri(1,2,3)

 $A \rightarrow .a A$  ------2  $A \rightarrow .b$  -----3

Reduce 3, as there is one element b in right, (2x1=) 2 elements would pop up

		Action			oto	
	а	b	<del>\$</del>	Α	S	
Io	S3	S4		2	1	
I <sub>1</sub>			Accepted			
I2	S3	S4		5		
I3	S3	<b>S4</b>		6		
I4	r3	r3	r3			
I5	r1	r1	r1			
<b>I</b> 6	r2	r2	r2			

Input: a a

 $A \rightarrow .a A -----2$   $A \rightarrow .b ----3$ 

Shift (S) = Si(1,2,3)Reduce (r) = ri(1,2,3)

Reduce 3, as there is one element b in right, (2x1=) 2 elements would pop up

		Actio	n	Go	to
	а	b	<del>\$</del>	А	S
Io	S3	S4		2	1
<b>I</b> 1			Accepted		
<b>I</b> 2	S3	S4		5	
<b>I</b> 3	S3	S4		6	
I4	r3	r3	r3		
<b>I</b> 5	r1	r1	r1		
<b>I</b> 6	r2	r2	r2		

Input: a a

A → . a A -----2

A → .b -----3

Shift $(S) = Si(1,2,3)$	
Reduce $(r) = ri(1,2,3)$	

Now, push A into stack

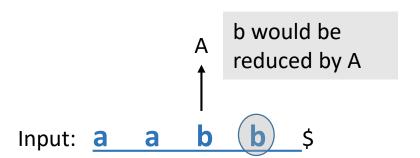
		Action			oto
	а	b	\$	Α	S
Io	S3	S4		2	1
I <sub>1</sub>			Accepted		
I2	S3	S4		5	
I3	S3	S4		6	
I4	r3	r3	r3		
I5	r1	r1	r1		
<b>I</b> 6	r2	r2	r2		

b would be reduced by A Input: a a

Here we can say,  $S \rightarrow . A A ------1$   $A \rightarrow . a A ------2$  $A \rightarrow . b ------3$ 

				Act	ioi	n			(	Go	to		
		á	э	b			\$		Α		<b>—</b>	S	<u> </u> 
	Io	S	3	<b>S4</b>					2			1	
	<b>I</b> 1					Α	ccept	ted					
	I2	S	3	<b>S4</b>					5				
•	I3	S	3	<b>S4</b>					6				
	<b>I</b> 4	r	3	r3			r3						
	<b>I</b> 5	r	1	r1			r1						
	<b>I</b> 6	r	2	r2			r2						
													_
	0	а	3	а		3	<b>b</b>	4	Д	6	5		

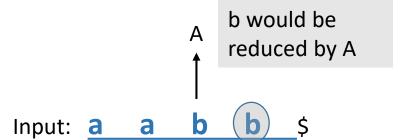
Shift (S) = Si (1,2,3) Reduce (r) = ri (1,2,3)



S → . A A1
A → . a A2
A → .b3

		Actic	n		Goto
	а	b	Α	S	
Io	S3	<b>S</b> 4		2	1
<b>I</b> 1			Accepted		
I2	S3	S4		5	
I3	S3	S4		6	
<b>I</b> 4	r3	r3	r3		
I <sub>5</sub>	r1	r1	r1		
I <sub>6</sub>	r2	r2	r2		

Shift (S) = Si(1,2,3)Reduce (r) = ri(1,2,3)



3

 $A \rightarrow .$  a  $A \rightarrow .$  Reduce 2, as there is two elements (a,A) in right, (2x2=) 4 elements would pop up in right, (2x2=) 4 elements would pop up Shift (S) = Si(1,2,3)Reduce (r) = ri(1,2,3)

		Actic	n	G	oto
	а	b	Α	S	
Io	<b>S</b> 3	<b>S4</b>		2	1
<b>I</b> 1			Accepted		
<b>I</b> 2	S3	S4		5	
<b>I</b> 3	S3	S4		6	
<b>I</b> 4	r3	r3	r3		
I5	r1	r1	r1		
I6	r2	r2	r2		

b would be reduced by A Input: a

 $S \rightarrow . A A -----1$ 

 $A \rightarrow .a A -----2$  $A \rightarrow .b -----3$ 

Reduce 2, as there is two elements (a,A) in right, (2x2=) 4 elements would pop up

Shift (S) = Si (1,2,3) Reduce (r) = ri (1,2,3)

a and A would be

		Actio	n		Goto
	а	b	Α	S	
Io	S3	S4		2	1
I <sub>1</sub>			Accepted		
I2	S3	S4		5	
I3	<b>S</b> 3	S4		6	
I4	r3	r3	r3		
<b>I</b> 5	r1	r1	r1		
I <sub>6</sub>	r2	r2	r2		

0 a 3 3 3 4 A 6

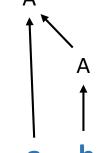
 $A \rightarrow .a A -----2$   $A \rightarrow .b -----3$ 

Now,	push A	A into	stack
,	P 0.0		0.0.0

Shift (S) = Si(1,2,3)Reduce (r) = ri(1,2,3)

		Actio	n	Œ	Goto
	а	b	Α	S	
Io	S3	<b>S4</b>		2	1
<b>I</b> 1			Accepted		
<b>I</b> 2	S3	S4		5	
<b>I</b> 3	S3	S4		6	
<b>I</b> 4	r3	r3	r3		
I5	r1	r1	r1		
<b>I</b> 6	r2	r2	r2		

a and A would be reduced by A



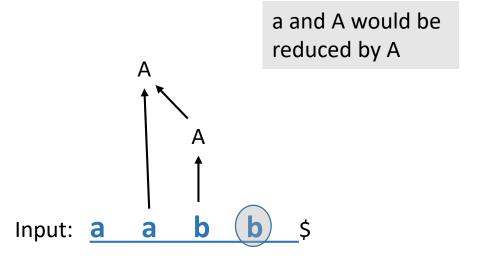
Input: a



Here we can say,  $S \rightarrow . A A ------1$   $A \rightarrow . a A ------2$  $A \rightarrow .b -----3$ 

		Actio	n	Go	oto	
	а	b	\$	А	<b>← S</b>	
Io	S3	S4		2	1	
<b>I</b> 1			Accepted			
<b>I</b> 2	S3	S4		5		
<b>I</b> 3	S3	S4		6		
<b>I</b> 4	r3	r3	r3			
<b>I</b> 5	r1	r1	r1			
<b>I</b> 6	r2	r2	r2			
						<u> </u>
0	a 3	(a) (c)	3 6 4		6 A	6

Shift (S) = Si (1,2,3) Reduce (r) = ri (1,2,3)



 $S \rightarrow . A A -----1$ 

 $A \rightarrow .a A -----2$  $A \rightarrow .b -----3$ 

Reduce 2, as there is two elements (a,A) in right, (2x2=) 4 elements would pop up

Shift (S) = Si (1,2,3)Reduce (r) = ri (1,2,3)

a and A would be

		Actio	n		Goto
	а	b	Α	S	
Io	S3	S4		2	1
<b>I</b> 1			Accepted		
I2	S3	S4		5	
I3	S3	S4		6	
I4	r3	r3	r3		
<b>I</b> 5	r1	r1	r1		
I <sub>6</sub>	r2	r2	r2		

0 a 3 3 3 4 A 6

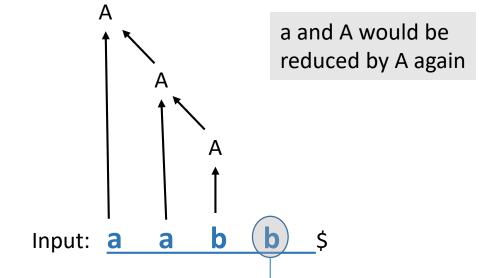
 $S \rightarrow . A A -----1$ 

 $A \rightarrow .a A -----2$  $A \rightarrow .b -----3$ 

Reduce 2, as there is two elements (a,A) in right, (2x2=) 4 elements would pop up

Shift (S) = Si (1,2,3)Reduce (r) = ri (1,2,3)

		Actic	n	(	Goto
	а	a b • \$			S
Io	S3	<b>S4</b>		2	1
<b>I</b> 1			Accepted		
I2	S3	S4		5	
I3	S3	S4		6	
<b>I</b> 4	r3	r3	r3		
I <sub>5</sub>	r1	r1	r1		
I <sub>6</sub>	r2	r2	r2		





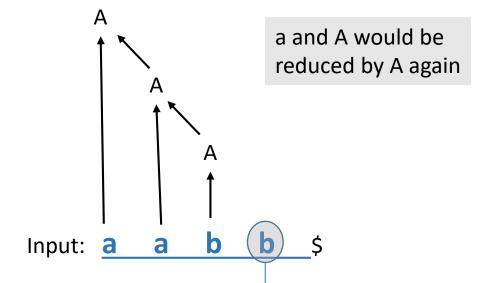
 $S \rightarrow AA -----1$ 

 $A \rightarrow .a A -----2$   $A \rightarrow .b ----3$ 

Now, push A into stace	Now,	push	A ir	nto	stac	C
------------------------	------	------	------	-----	------	---

Shift (S) = Si(1,2,3)Reduce (r) = ri(1,2,3)

		Acti	on	(	Goto
	а	b	\$	Α	S
Io	S3	<b>S</b> 4		2	1
I <sub>1</sub>		Г	Accepted		
I2	S3	<b>S4</b>		5	
I3	S3	<b>S4</b>		6	
<b>I</b> 4	r3	r3	r3		
I5	r1	r1	r1		
I <sub>6</sub>	r2	r2	r2		



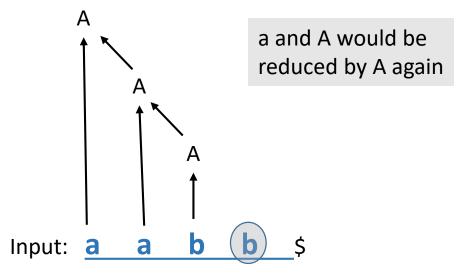


Here we can say,  $S \rightarrow . A A -----1$  $A \rightarrow . a A -----2$ 

A → .b ----3

		Actio	n	G	oto		
	а	b	\$	А	S		
Io	S3	S4		2	1		
<b>I</b> 1			Accepted				
<b>I</b> 2	S3	S4		5			
<b>I</b> 3	S3	S4		6			
<b>I</b> 4	r3	r3	r3				
<b>I</b> 5	r1	r1	r1				
<b>I</b> 6	r2	r2	r2				
					•	•	

Shift (S) = Si (1,2,3) Reduce (r) = ri (1,2,3)



Here we can say,  $S \rightarrow AA -----1$  $A \rightarrow .a A -----2$   $A \rightarrow .b -----3$ 

Shift (S) = $Si(1,2,3)$
Reduce $(r) = ri(1,2,3)$

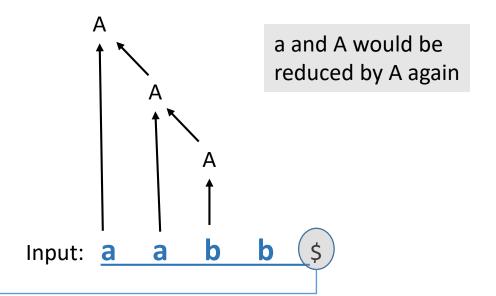
			Actio	n	Go	oto	
		аг	b	<del>\$</del>	Α	S	
	Io	S3	S4		2	1	A
	I <sub>1</sub>			Accepted			a and A would be reduced by A again
$\rightarrow$	I2	S3	S4 —		5		A A
	<b>I</b> 3	S3	S4		6		
	I4	r3	r3	r3			
	<b>I</b> 5	r1	r1	r1			Input: a a b b s
	<b>I</b> 6	r2	r2	r2			Input: <u>a a b (b) </u> \$
	0	3		3 b 4	A	6 A	6 A 2 b 4
	U	<b>a B</b>		304		O A	A 2 0 4

 $A \rightarrow .a A -----2$   $A \rightarrow .b ----3$ 

Reduce 3, as there is one element (b) in right, (2x1=) 2 elements would pop up

Shift (S) = $Si(1,2,3)$
Reduce $(r) = ri(1,2,3)$

		Actio		Go	oto		
	а	b	\$		lacksquare	Α	S
Io	<b>S</b> 3	<b>S4</b>				2	1
<b>I</b> 1			Accepted			_	
<b>I</b> 2	<b>S</b> 3	S4				5	
<b>I</b> 3	<b>S</b> 3	S4				6	
I4	r3	r3	r3				
<b>I</b> 5	r1	r1	r1				
<b>I</b> 6	r2	r2	r2				



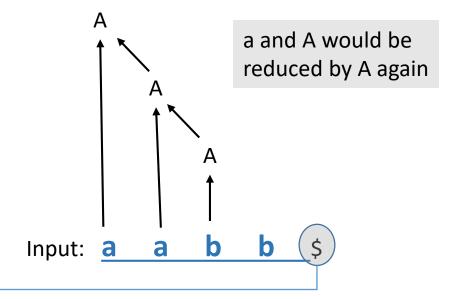


 $A \rightarrow .a A -----2$   $A \rightarrow .b ----3$ 

Reduce 3, as there is one element (b) in right, (2x1=) 2 elements would pop up

Shift (S) = $Si(1,2,3)$
Reduce $(r) = ri(1,2,3)$

		Actio	Go		oto		
	а	b	\$		<b>—</b>	Α	5
Io	S3	<b>S4</b>				2	1
<b>I</b> 1			Accepted				
I2	S3	S4				5	
<b>I</b> 3	S3	<b>S4</b>				6	
<b>I</b> 4	r3	r3	r3				
<b>I</b> 5	r1	r1	r1				
<b>I</b> 6	r2	r2	r2				



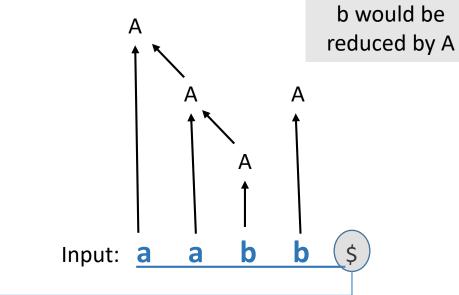


 $A \rightarrow .a A -----2$ 

A → .b -----3

Shift (S) = Si(1,2,3)Reduce (r) = ri(1,2,3)

		Actio		Go	oto		
	а	b	\$		lacksquare	Α	S
Io	S3	<b>S4</b>				2	1
<b>I</b> 1			Accepted				
<b>I</b> 2	S3	S4				5	
<b>I</b> 3	S3	S4				6	
<b>I</b> 4	r3	r3	r3				
<b>I</b> 5	r1	r1	r1				
<b>I</b> 6	r2	r2	r2				



Here we can say,  $S \rightarrow . A A ------1$   $A \rightarrow . a A -----2$  $A \rightarrow .b -----3$  Shift (S) = Si (1,2,3) Reduce (r) = ri (1,2,3)

		Actio	on	Go	oto	
	а	b	\$	А	<b>S</b> − S	b would be
Io	S3	S4		2	1	reduced by A
<b>I</b> 1			Accepted			
<b>→</b> I2	S3	S4		5		A A
<b>I</b> 3	S3	S4		6		
<b>I</b> 4	r3	r3	r3			
I5	r1	r1	r1			
<b>I</b> 6	r2	r2	r2			Input: <u>a a b b (</u> \$)
0	3		3 6 4		6 A	6 A 2 6 A 5

Shift (S) = Si (1,2,3) Reduce (r) = ri (1,2,3)

Here we can say,

 $S \rightarrow . A A -----1$ 

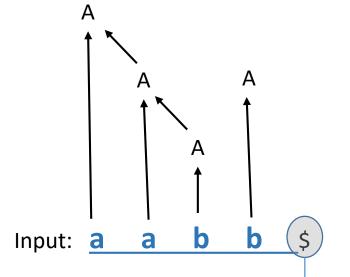
A → . a A -----2

A → .b -----3

Reduce 1, as there are two elements (A,A) in right, (2x2=) 4 elements would pop up

b	would be	
e	duced by A	

		Actio	n		Goto		
	а	b	\$		\$ • A		
Io	S3	<b>S4</b>			2	1	
<b>I</b> 1			Accepted				
I2	S3	S4			5		
<b>I</b> 3	S3	S4			6		
I4	r3	r3	r3				
I <sub>5</sub>	r1	r1	r1				
I <sub>6</sub>	r2	r2	r2				





 $S \rightarrow . AA -----1$ 

 $A \rightarrow .aA -----2$ 

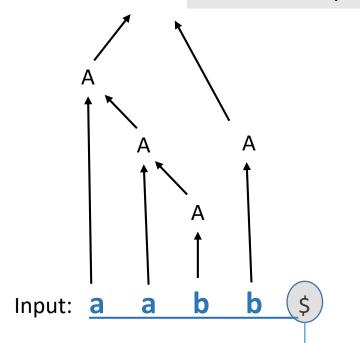
A → .b ----3

Reduce 1, as there are two elements (A,A) in right, (2x2=) 4 elements would pop up

Shift (S) = Si (1,2,3) Reduce (r) = ri (1,2,3)

> A and A would be reduced by S

	Action			Goto		
	а	b	\$		<b>▼</b> A	S
Io	S3	<b>S4</b>			2	1
<b>I</b> 1			Accep	ted		
I2	S3	<b>S4</b>			5	
<b>I</b> 3	S3	<b>S4</b>			6	
I4	r3	r3	r3			
I <sub>5</sub>	r1	r1	r1			
<b>I</b> 6	r2	r2	r2			



Here we can say, 
$$S \rightarrow AA -----1$$

A → . a A -----2

A → .b ----3

Now	nuch	ς	into	stack
NOW,	pusii	2	IIILO	Stack

Shift (S) = Si (1,2,3)	
Reduce $(r) = ri(1,2,3)$	

A and A would be reduced by S

	A ↑	*			
		A	Α •	A	
Input:	<u>a</u>	 а	b b	b	\$

	Action			Goto		
	а	b	\$		<b>◆</b> A	S
Io	<b>S</b> 3	<b>S4</b>			2	1
<b>I</b> 1			Accep	ted		
<b>I</b> 2	S3	S4			5	
<b>I</b> 3	S3	<b>S4</b>			6	
<b>I</b> 4	r3	r3	r3			
<b>I</b> 5	r1	r1	r1			
<b>I</b> 6	r2	r2	r2			

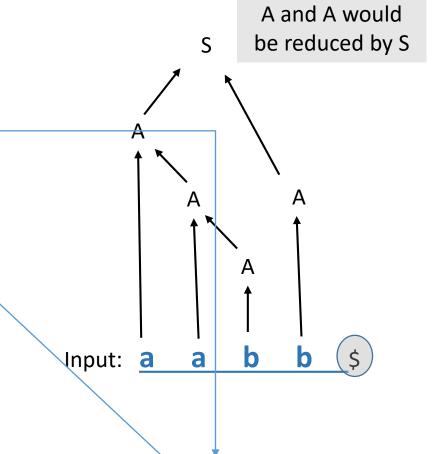
 $S \rightarrow . A A -----1$ 

 $A \rightarrow .aA -----2$ 

A → .b -----3

Shift (S) = $Si(1,2,3)$
Reduce $(r) = ri(1,2,3)$

	Action			Go	oto	
	а	b	\$	Α	S	
I <sub>0</sub>	S3	S4		2	1 —	
<b>I</b> 1			Accepted			
I2	S3	S4		5		
<b>I</b> 3	S3	S4		6		
I4	r3	r3	r3			
<b>I</b> 5	r1	r1	r1			
<b>I</b> 6	r2	r2	r2			



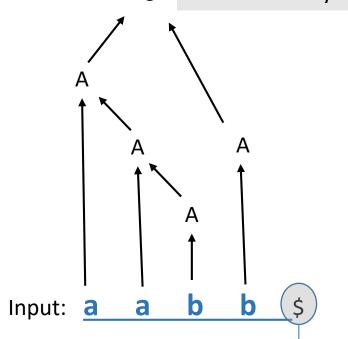
 $A \rightarrow .aA -----2$ 

A → .b ----3

	1				
		Actio	Goto		
	а	b	\$	A	S
Io	S3	S4		2	1
I <sub>1</sub>			Accepted		
I2	S3	S4		5	
<b>I</b> 3	S3	S4		6	
I4	r3	r3	r3		
I5	r1	r1	r1		
I <sub>6</sub>	r2	r2	r2		

Shift (S) = Si(1,2,3)Reduce (r) = ri(1,2,3)

> A and A would be reduced by S





## THANK YOU