Objectives

You should be able to ...

Shift-Reduce Conflicts

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- Explain the circumstances that cause a shift-reduce conflict.
- ▶ Use the presence of a shift-reduce conflict to detect ambiguity.
- Explain how a shift-reduce conflict could be fixed.
- Explain what an LR parser generator will do if the shift-reduce conflict is not fixed.



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The Automata, Starting

- Let's build the table for this automata.
- ► Can you tell that it is ambiguous right now?

$$S \rightarrow aEb$$

$$\mid x$$

$$E \rightarrow ExE$$

$$\mid b$$

The Automata, Starting

- Let's build the table for this automata.
- ► Can you tell that it is ambiguous right now?
- ► Is b x b x b to be parsed as (b x b) x b or b x (b x b)?

$$\begin{array}{ccc}
S & \rightarrow & a E b \\
& | & x \\
E & \rightarrow & E x E \\
& | & b
\end{array}$$



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Step 1

I₀ S → •aEb •abS

S

Ε

Grammar		Δ	ctio	n				
		a	b	Х	\$		а	b
	0					0		
	1					1		
$S \rightarrow aEb$	2					0 1 2 3 4 5		
l abs	3					3		
abS E → ExE	4					4		
b	5					5		
1 3	6					6		

a b

0 s

Χ

Step 1

$$\begin{array}{ccc} I_0 & S \rightarrow & \bullet \, a \, E \, b \, \Leftarrow \\ & \bullet \, a \, b \, S \, \Leftarrow \end{array}$$

Grammar

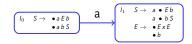
				a	b	Х	\$		a	
			0					0		Ī
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S	\rightarrow	a E b	2					2		
J	í	ahs	3					3		Ī
Ε	\rightarrow	a b S E x E	4					4		ĺ
_	ĺ	b	5					5		
	'	-	6					6		L

Action

Goto

b x \$ S E

Step 2





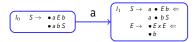
_						
\$		a	b	Х	\$ S	Е
	0	1				
	1					
	2					
	3					
	4					
	5					
	6					

Goto

Х

\$ S E

Step 2



S	\rightarrow	a E b					
	Ĺ	a b S		a	b	Х	\$
Ε	\rightarrow	$E \times E$	0	S			
		b	1				
			2				
			3				
			4				
			5				
			6				

	a	b	Х	\$ S	E
0	1				
1					
2					
3					
4					
5					
6					

4□ → 4□ → 4 = → 4 = → 9

Shift-Reduce Conflicts Shift-Reduce Conflicts Introduction The Automata Introduction The Automata 0000000000 0000000000

Step 3



S

4 5 6

a b x

\$

		a	b	Х	\$ S	Е
	0	1				
	1					2
	2					
	3					
	4					
	5					
	6					

Step 3



$$S \rightarrow aEb$$

$$| abS$$

$$E \rightarrow ExE$$

$$| b$$

	a	b	Х	\$		a	b	Х	\$ S	Е
0	S				0	1				
1					1					2
2					2					
3					3					
4					4					
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6					6					

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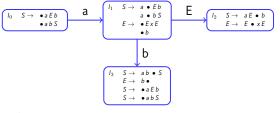
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4□ > 4個 > 4 분 > 4 분 > 1 분 9 Q @

4□ → 4□ → 4 = → 4 = → 9

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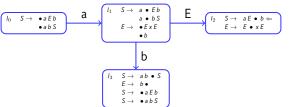
Step 4





	a	b	х	\$		a	b	Х	\$ S	Е
0	S				0	1				
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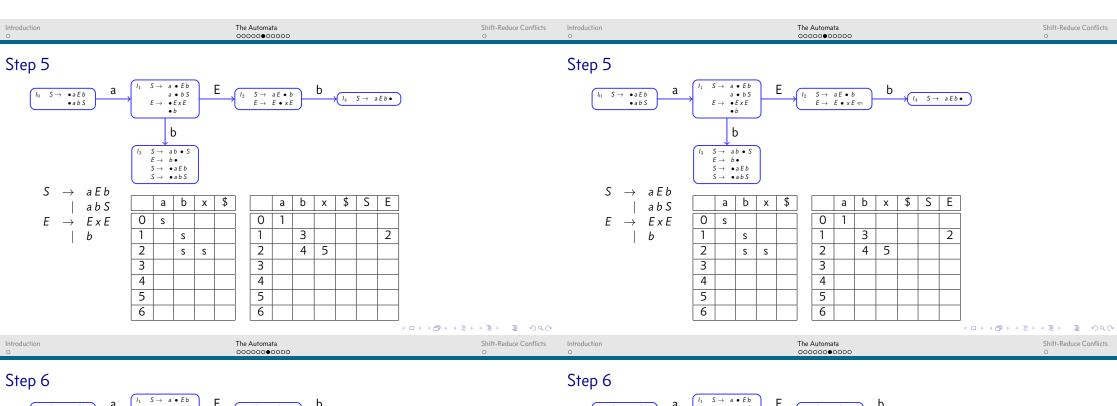
Step 4

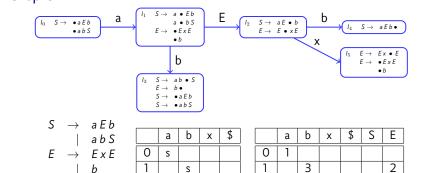




	a	b	Х	\$		a	b	Х	\$ S	E
0	S				0	1				
1		S			1		3			2
2					2					
3					3					
4					4					
5					5					
6					6					

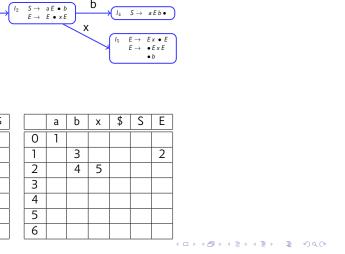


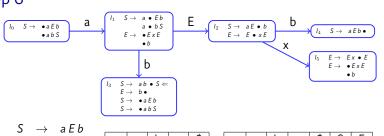


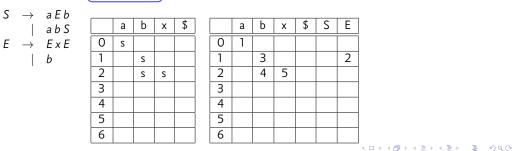


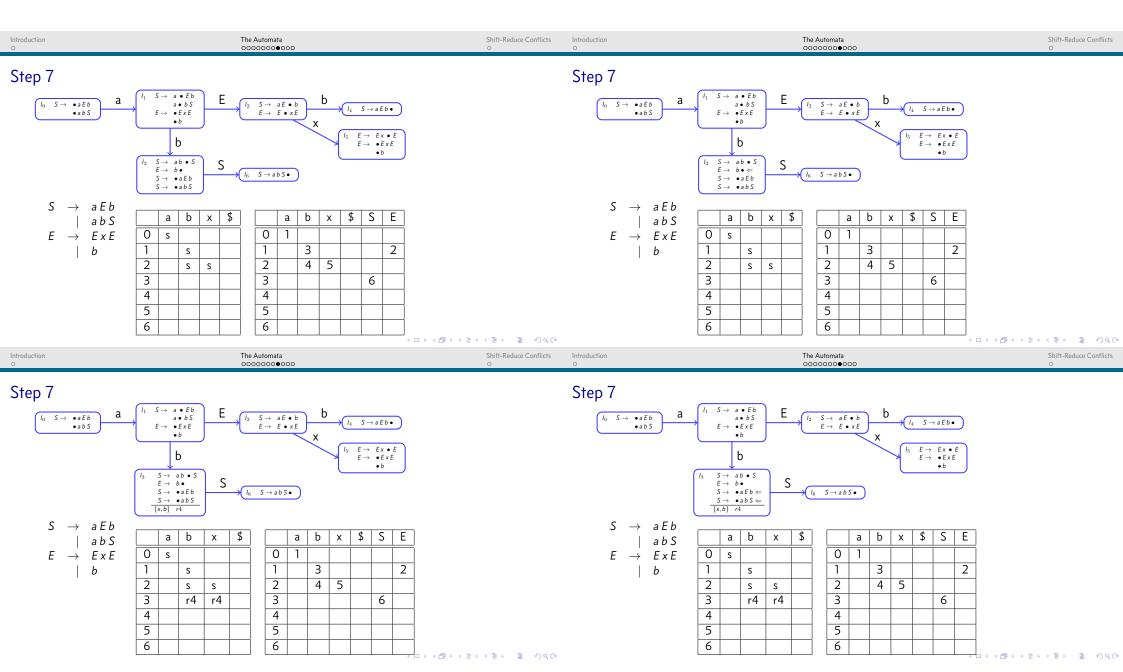
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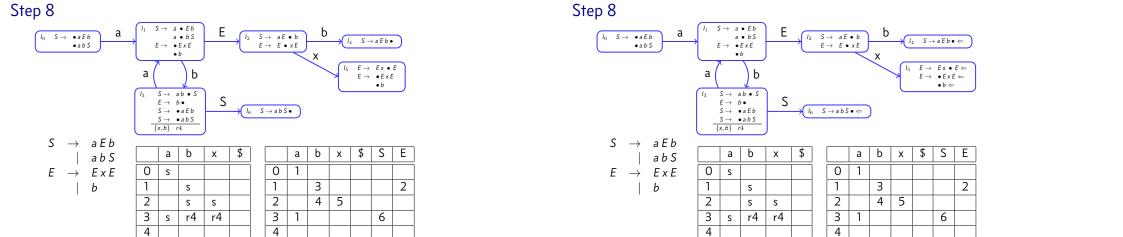
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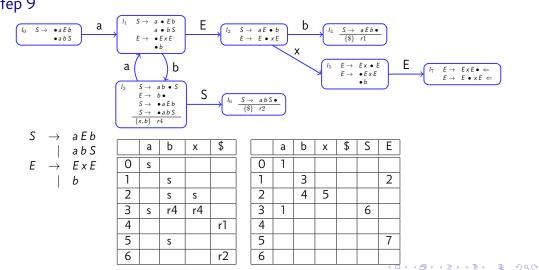




Introduction

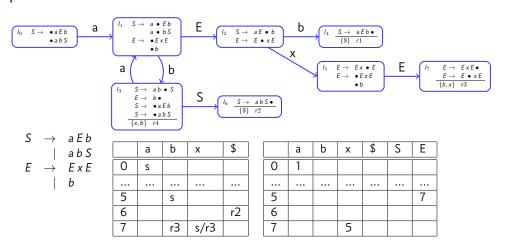
Shift-Reduce Conflicts





The Automata

Introduction



The Automata



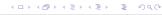
Shift-Reduce Conflicts

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Shift-Reduce Conflicts



- ► The FIRST set of E says "shift."
- ► The FOLLOW set of E says "reduce."
- Fix this by changing precedence or associativity.
- ► What if you don't fix this?



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Shift-Reduce Conflicts



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