

# Compiler Design

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# SLR(1) Grammar

- The SLR method begins with LR(0) items and LR(0) automata
- *Constructing an SLR-parsing table*

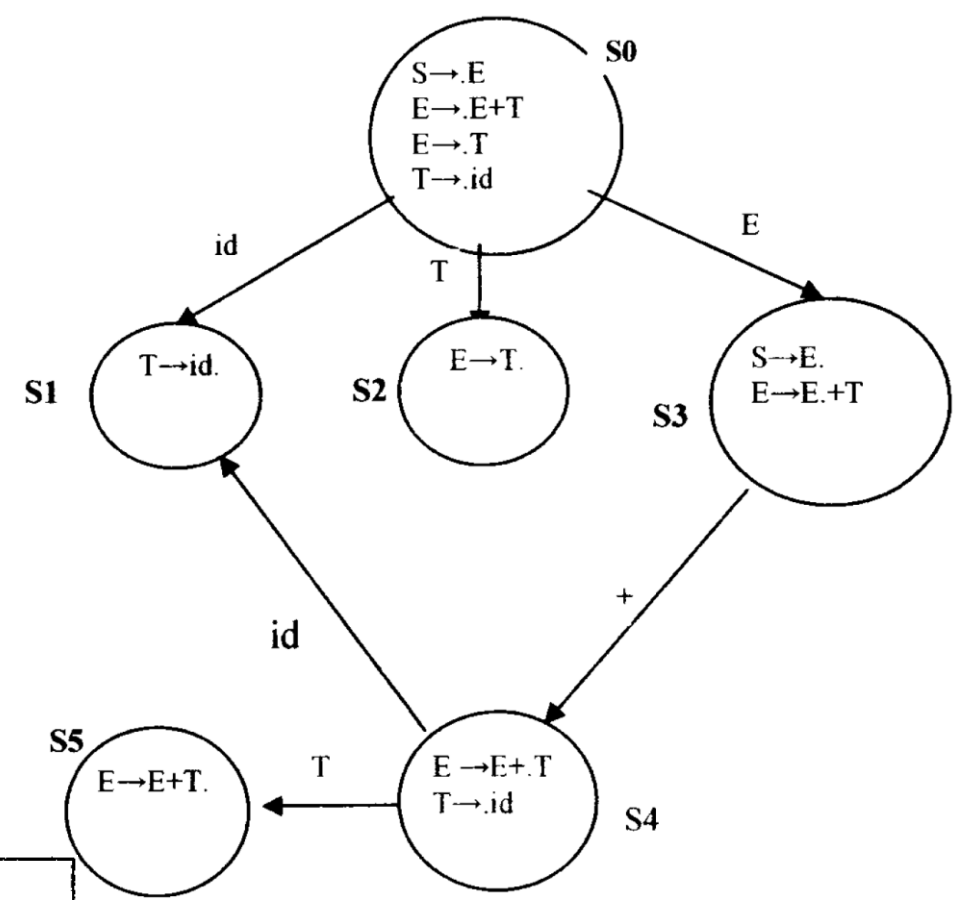
State  $i$  is constructed from  $I_i$ . The parsing actions for state  $i$  are determined as follows:

- (a) If  $[A \rightarrow \alpha \cdot a \beta]$  is in  $I_i$  and  $\text{GOTO}(I_i, a) = I_j$ , then set  $\text{ACTION}[i, a]$  to “shift  $j$ .” Here  $a$  must be a terminal.
- (b) If  $[A \rightarrow \alpha \cdot]$  is in  $I_i$ , then set  $\text{ACTION}[i, a]$  to “reduce  $A \rightarrow \alpha$ ” for all  $a$  in  $\text{FOLLOW}(A)$ ; here  $A$  may not be  $S'$ .
- (c) If  $[S' \rightarrow S \cdot]$  is in  $I_i$ , then set  $\text{ACTION}[i, \$]$  to “accept.”

# SLR(1) Grammar

- **Example**

- 1-  $S \rightarrow E$
- 2-  $E \rightarrow E+T$
- 3-  $E \rightarrow T$
- 4-  $T \rightarrow id$



حالات	action			goto	
	id	+	\$	T	E
0	s1	error	error	2	3
1	error	r4	r4		
2	error	r3	r3		
3	error	s4	accept		
4	s1	error	error	5	
5	error	r2	r2		

# SLR(1) Grammar

- **Example:** Parse string id+id

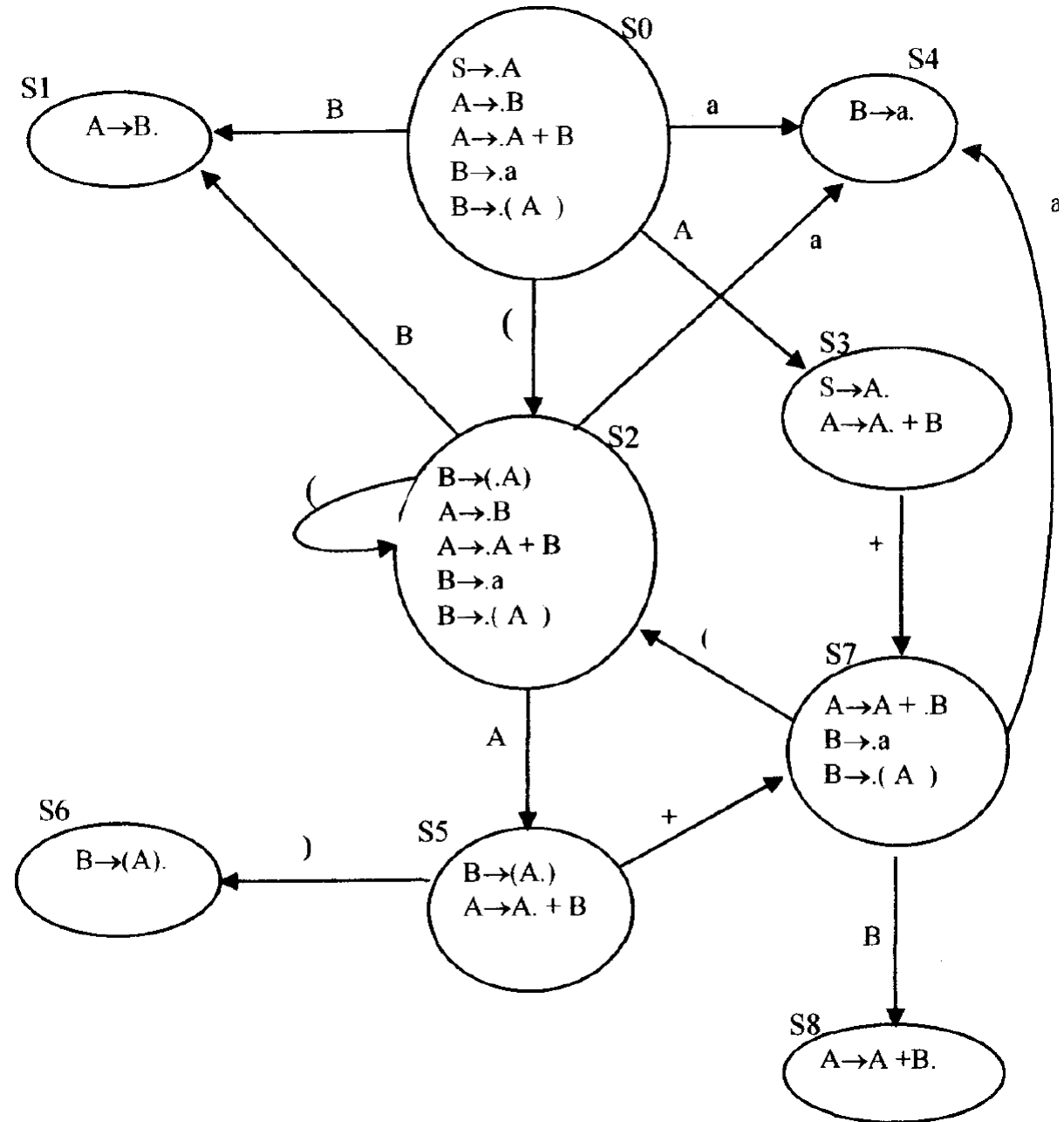
پشته	رشته ورودی	عملیات
0	id+id\$	s1
0id1	+id\$	r4: $T \rightarrow id$
0T	+id\$	goto[0,T]=2
0T2	+id\$	r3: $E \rightarrow T$
0E	+id\$	goto[0,E]=3
0E3	+id\$	s4
0E3+4	id\$	s1
0E3+4id1	\$	r4: $T \rightarrow id$
0E3+4T	\$	goto[4,T]=5
0E3+4T5	\$	r2: $E \rightarrow E+T$
0E	\$	goto[0,E]=3
0E3	\$	accept

# SLR(1) Grammar

- **Example**

$A \rightarrow B$   
 $A \rightarrow A + B$   
 $B \rightarrow a$   
 $B \rightarrow ( A )$

1-  $S \rightarrow A$   
2-  $A \rightarrow B$   
3-  $A \rightarrow A + B$   
4-  $B \rightarrow a$   
5-  $B \rightarrow ( A )$



# SLR(1)

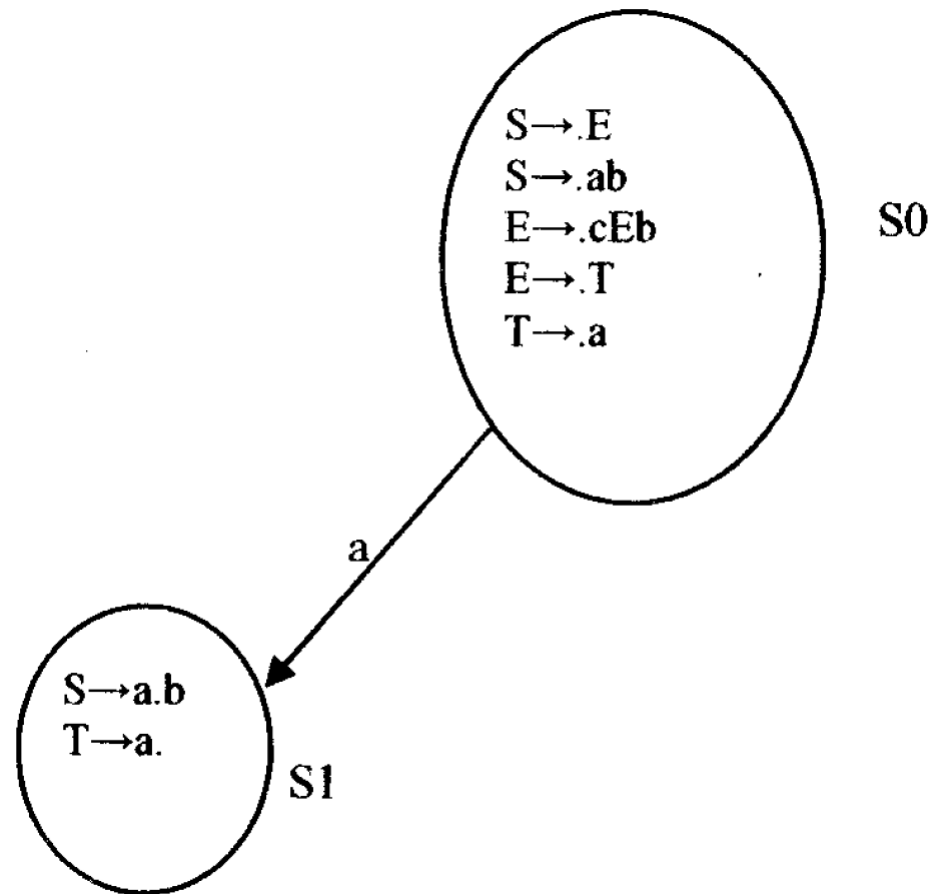
حالت	action					goto	
	a	+	(	)	\$	A	B
0	s4		s2			3	1
1		r2		r2	r2		
2	s4		s2			5	1
3		s7			accept		
4		r4		r4	r4		
5		s7		s6			
6		r5		r5	r5		
7	s4		s2				8
8		r3		r3	r3		

پشته	رشته ورودی	اعمال انجام شده
0	(a+a)\$	s2
0(2	a+a)\$	s4
0(2a4	+a)\$	r4: B→a
0(2B1	+a)\$	r2: A→B
0(2A5	+a)\$	s7
0(2A5+7	a)\$	s4
0(2A5+7a4	)\$	r4: B→a
0(2A5+7B8	)\$	r3: A→A+B
0(2A5	)\$	s6
0(2A5)6	\$	r5: B→(A)
0A3	\$	accept

# SLR(1) Grammar

- **Example: Shift/Reduce Conflict**
  - The grammar is not SLR(1)

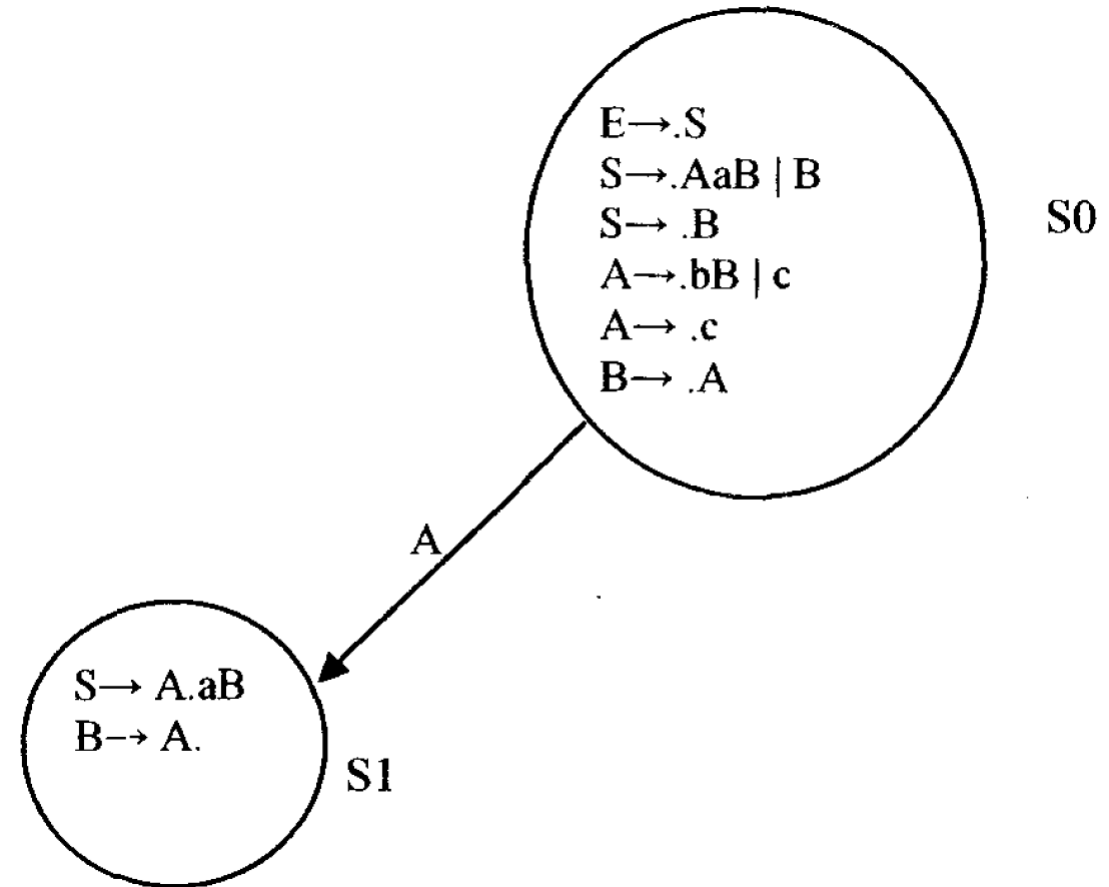
$S \rightarrow E \mid ab$   
 $E \rightarrow cEb \mid T$   
 $T \rightarrow a$



# SLR(1) Grammar

- **Example: Shift/Reduce Conflict**
  - The grammar is not SLR(1)

$S \rightarrow AaB \mid B$   
 $A \rightarrow bB \mid c$   
 $B \rightarrow A$

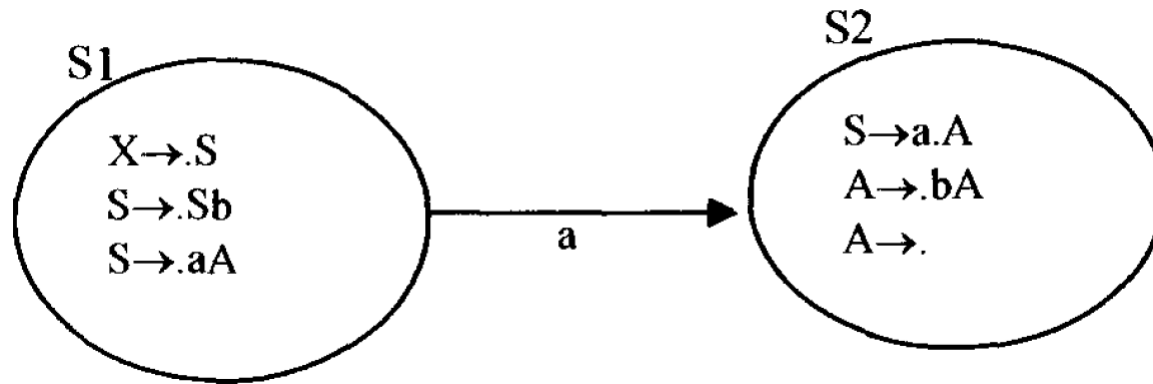




# SLR(1) Grammar

- **Example: Shift/Reduce Conflict**
  - The grammar is not SLR(1)

$S \rightarrow Sb \mid aA$   
 $A \rightarrow bA \mid \epsilon$



# SLR(1) Grammar

- **Example: Shift/Reduce Conflict**
  - The grammar is not SLR(1)

$S \rightarrow aACb$   
 $A \rightarrow b \mid \epsilon$   
 $C \rightarrow cC \mid \epsilon$

