

# Lecture 11

# **Syntax Analysis**

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Parser State



- Parser State
- Agumentation of the Grammar



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- Agumentation of the Grammar
- LR(0) items



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- Start State



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- Goto
- Parse Table creation



# Applying symbols in a state



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- Create new state and include all the items that have appropriate input symbol just after the "."
- Advance "." in those items and take closure





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- If I is  $E' \rightarrow E$ .  $E \rightarrow E \cdot + T$ then goto(I,+) is  $E \rightarrow E + \cdot T$   $T \rightarrow \cdot T * F$   $T \rightarrow \cdot F$   $F \rightarrow \cdot (E)$  $F \rightarrow id$



#### **Sets of items**

- ullet C : Collection of sets of LR(0) items for grammar G'
- $C = closure (S' \rightarrow .S)$  repeat

until no more additions

```
for each set of items I in C
    and each grammar symbol X
    such that goto (I,X) is not empty and not in C
    ADD goto(I,X) to C
```

initially, add start state (set of items corresponding to the start state) and then add other set of items (states) by using GOTO operation.



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SLR is too weak to handle most languages!

parse table creation for SLR(1)



#### Homework

• Create SLR Parse table for the following grammar (homework)

 $S' \to S$ 

 $S \rightarrow L = R$ 

 $S \rightarrow R$ 

 $L \rightarrow *R$ 

 $L \rightarrow id$ 

 $R \rightarrow L$ 



#### Parse Table

#### SLR parse table for the grammar

	=	*	id	\$	S	L	R
0		s4	<i>s</i> 5		1	2	3
1				acc			
2	s6,r6			r6			
3				r3			
4		s4	<i>s</i> 5			8	7
5	r5			r5			
6		s4	<i>s</i> 5			8	9
7	r4			r4			
8	r6			r6			
9				r2			

The table has multiple entries in action[2,=]

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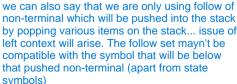


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Both SR and RR conflict can occur in SLR parsing.

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- However, when state I appears on the top of the stack, the viable prefix  $\beta\alpha$  on the stack may be such that  $\beta\alpha$  can not be followed by symbol "a" in any right sentential form
- ullet Thus, the reduction by the rule A 
  ightarrow lpha on symbol "a" is invalid
- SLR parsers cannot remember the left context





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- The general form of the item becomes  $[A \to \alpha.\beta, a]$  which is called LR(1) item.
- Item  $[A \to \alpha., a]$  calls for reduction only if next input is a. The set of symbols "a"s will be a subset of Follow(A)



# Closure(I)

```
repeat for each item [A \to \alpha.B\beta, a] in I for each production B \to \gamma in G' and for each terminal b in First(\beta a) add item [B \to .\gamma, b] to I until no more additions to I
```

follow (B) is made first (beta a) follow (B) may contain follow (A)



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$$C \setminus d$$



