

Programming Languages and Compilers: Quiz #5

Due on April 25, 2024 at 4:00pm

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Problem 1

Prove or disprove that the following grammar is SLR(1)

$$\begin{aligned} S &\rightarrow \text{StmtList } \$ \\ \text{StmtList} &\rightarrow \text{Stmt semi StmtList} \\ &\quad | \text{Stmt} \\ \text{Stmt} &\rightarrow s \end{aligned}$$

Solution

Given the grammar:

$$\begin{aligned} \text{Start} &\rightarrow \text{StmtList} \$ \\ \text{StmtList} &\rightarrow \text{Stmt semi StmtList} \mid \text{Stmt} \\ \text{Stmt} &\rightarrow s \end{aligned}$$

The follow sets are provided as:

- $\text{Follow}(\text{Start}) = \{\}$
- $\text{Follow}(\text{StmtList}) = \{\$, \}$
- $\text{Follow}(\text{Stmt}) = \{\text{semi}, \$\}$

LR(0) Items and Automaton

$$\begin{aligned} \text{Start}' &\rightarrow \cdot \text{Start} \\ \text{Start} &\rightarrow \cdot \text{StmtList} \$ \\ \text{I0: StmtList} &\rightarrow \cdot \text{Stmt semi StmtList} \\ \text{StmtList} &\rightarrow \cdot \text{Stmt} \\ \text{Stmt} &\rightarrow \cdot s \end{aligned}$$

$$\text{I1: Start} \rightarrow \text{StmtList} \cdot \$$$

$$\begin{aligned} \text{Stmt} &\rightarrow s \cdot \\ \text{I2: StmtList} &\rightarrow \text{Stmt} \cdot \text{semi StmtList} \\ \text{StmtList} &\rightarrow \text{Stmt} \cdot \end{aligned}$$

$$\text{I3: StmtList} \rightarrow \text{Stmt} \cdot$$

$$\begin{aligned} \text{StmtList} &\rightarrow \text{Stmt semi} \cdot \text{StmtList} \\ \text{I4: StmtList} &\rightarrow \cdot \text{Stmt semi StmtList} \\ \text{StmtList} &\rightarrow \cdot \text{Stmt} \\ \text{Stmt} &\rightarrow \cdot s \end{aligned}$$

$$\text{I5: StmtList} \rightarrow \text{Stmt semi StmtList} \cdot$$

Parsing Table

State	s	semi	\$	Stmt	StmtList
I_0	$s2$			3	1
I_1			accept		
I_2		$s4$	$r(\text{Stmt} \rightarrow s)$		
I_3		$r(\text{StmtList} \rightarrow \text{Stmt})$	$r(\text{StmtList} \rightarrow \text{Stmt})$		
I_4	$s2$			3	5
I_5		$r(\text{StmtList} \rightarrow \text{Stmt semi StmtList})$	$r(\text{StmtList} \rightarrow \text{Stmt semi StmtList})$		

Conclusion

The constructed SLR(1) parsing table does not have any shift/reduce or reduce/reduce conflicts based on the given Follow sets and the automaton. Thus, the grammar is SLR(1).

This concludes the proof that the grammar is SLR(1) as no conflicts were identified in the parsing table.