Solution – Homework 9: Lectures 17 – 19

CS 440: Programming Languages and Translators, Spring 2020

Lecture 17: LR Parsing pt 1: Bottom-Up and Shift-Reduce Parsing

1.   (The LR(0) items for 0: $S' \to S$ \$, 1: $S \to D$, 2: $D \to$ d E, 3: $D \to E$, 4: $E \to$ e, 5: $E \to \varepsilon$)

- 0a: $S' \to \bullet\, S$ \$, 0b: $S' \to S \bullet$ \$, 0c: $S' \to S$ \$ $\bullet$
- 1a: $S \to \bullet\, D$, 1b: $S \to D \bullet$
- 2a: $D \to \bullet\,$ d E, 2b: $D \to$ d $\bullet E$, 2c: $D \to$ d $E \bullet$
- 3a: $D \to \bullet\, E$, 3b: $D \to E \bullet$
- 4a: $E \to \bullet\,$ e, 4b: $E \to$ e $\bullet$
- 5a: $E \to \bullet\, \varepsilon$, 5b: $E \to \varepsilon \bullet$

Lecture 18: LR Parsing pt. 2: LR(0) and SLR(1) Parsers

2.   (SLR(1) parser for grammar from Problem 1: 0: $S' \to S$ \$, 1: $S \to D$, 2: $D \to$ d E, 3: $D \to E$, 4: $E \to$ e, 5: $E \to \varepsilon$)

   a.   (The Action/Go-To table)

State #	Items	Actions			GoTo		
		d	e	$	S	D	E
0	{0a: $S' \to \bullet\, S$ \$, 1a: $S \to \bullet\, D$, 2a: $D \to \bullet\,$ d E, 3a: $D \to \bullet\, E$, 4a: $E \to \bullet\,$ e, 5b: $E \to \varepsilon \bullet$}	s3: {2b, ...}	s6: {4b}	r5	1: {0b}	2: {1b}	5: {3b}
1	{0b: $S' \to S \bullet$ \$}			accept			
2	{1b: $S \to D \bullet$}			r1			
3	{2b: $D \to$ d $\bullet E$, 4a: $E \to \bullet\,$ e, 5b: $E \to \varepsilon \bullet$}		s6: {4b}	r5			4: {2c}
4	{2c: $D \to$ d $E \bullet$}			r2			
5	{3b: $D \to E \bullet$}			r3			
6	{4b: $E \to$ e $\bullet$}			r4			

SLR(1) Parser for 0: $S' \to S$ \$, 1: $S \to D$, 2: $D \to$ d E, 3: $D \to E$, 4: $E \to$ e, 5: $E \to \varepsilon$

   b.   (Traces of the parses of (1) d \$ and (2) e \$)

SLR(1) Parse of d \$

Stack (top at right)	Input	Action
0	d \$	s3
0 d 3	\$	r5
0 d 3 E 4	\$	r2
0 D 2	\$	r1
0 S 1	\$	accept

SLR(1) Parse of e \$

Stack (top at right)	Input	Action
0	e \$	s6
0 e 6	\$	r4
0 E 5	\$	r3
0 D 2	\$	r1
0 S 1	\$	accept

 Problem 3 solution omitted