

CS 702/602: Assignment Solution 1

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Problem 1

S - subscript list, A - argument-list,

1. $O \rightarrow \text{this} \acute{O} | \text{identifier} K | \acute{O}$
2. $\acute{O} \rightarrow . \text{identifier} K \acute{O} | \epsilon$
3. $K \rightarrow S | (A)$
4. $S \rightarrow \acute{S}$
5. $\acute{S} \rightarrow [\text{identifier}] \acute{S} | \epsilon$
6. $A \rightarrow \text{identifier} \acute{A}$
7. $\acute{A} \rightarrow , \text{identifier} \acute{A} | \epsilon$

Table 1: Parsing Table LL(1)

| | INPUT SYMBOL | | | | | | | | |
|-------------|---|---|---|---------------------|----------------------------------|---|---|---|----------------------------------|
| | this | identifier | . | (|) | [|] | , | \$ |
| O | $O \rightarrow \text{this} \acute{O}$ | $O \rightarrow \text{identifier} K \acute{O}$ | | | | | | | |
| K | | | $K \rightarrow S$ | $K \rightarrow (A)$ | | $K \rightarrow S$ | | | $K \rightarrow S$ |
| \acute{O} | | | $\acute{O} \rightarrow . \text{identifier} K \acute{S}$ | | | | | | $\acute{O} \rightarrow \epsilon$ |
| S | | | $S \rightarrow \acute{S}$ | | | $S \rightarrow \acute{S}$ | | | $S \rightarrow \acute{S}$ |
| \acute{S} | | | | | | $\acute{S} \rightarrow [\text{identifier}] \acute{S}$ | | | |
| A | $A \rightarrow \text{identifier} \acute{A}$ | $O \rightarrow \text{identifier} K \acute{O}$ | | | | | | | |
| \acute{A} | | | | | $\acute{A} \rightarrow \epsilon$ | | | $\acute{A} \rightarrow , \text{identifier} \acute{A}$ | |

Problem 2

- I_0 , GOTO(\hat{O} , $\$$)
 - $O \rightarrow .O , \$$
 - $O \rightarrow .this , ./\$$
 - $O \rightarrow .identifierS , ./\$$
 - $O \rightarrow .O.identifierS , ./\$$
 - $O \rightarrow .identifier(A) , ./\$$
 - $O \rightarrow .O.identifier(A) , ./\$$
- I_1 GOTO(I_0 , O)
 - $O \rightarrow O. , \$$
 - $O \rightarrow O.identifierS , ./\$$
 - $O \rightarrow O.identifier (A) , ./\$$
- I_2 , GOTO(I_0 , $this$)
 - $O \rightarrow this. , ./\$$
- I_3 GOTO(I_0 , $identifier$)
 - $O \rightarrow identifier .S , ./\$$
 - $S \rightarrow S[identifier] , [./\$$
 - $O \rightarrow identifier (A) , ./\$$
- I_4 GOTO(I_1 , $.$)
 - $O \rightarrow O.identifierS , ./\$$
 - $O \rightarrow O.id (A) , /\$$
- I_5 GOTO(I_3 , S)
 - $O \rightarrow identifier S. , ./\$$
 - $S \rightarrow S.[identifier] , [./\$$
- I_6 GOTO(I_3 , $()$)
 - $O \rightarrow identifier (.A) , ./\$$
 - $A \rightarrow .A , identifier ,)/ ,$
 - $A \rightarrow .identifier ,)/ ,$
- I_7 GOTO(I_4 , $identifier$)
 - $O \rightarrow O . identifier. S , ./\$$
 - $O \rightarrow O . identifier. (A) , ./\$$
 - $S \rightarrow .S[identifier] , [./\$$
- I_8 GOTO(I_5 , $[]$)
 - $S \rightarrow S [identifier] , [./\$$
- I_9 GOTO(I_6 , A)
 - $O \rightarrow identifier (A.) , ./\$$
 - $A \rightarrow A.,identifier ,)/ ,$
- I_{10} GOTO(I_6 , $identifier$)
 - $A \rightarrow identifier. ,)— ,$
- I_{11} : GOTO(I_7 , S)
 - $O \rightarrow O.identifierS. , ./\$$
 - $S \rightarrow S.[identifier] , [./\$$
- I_{12} : GOTO(I_7 , $()$)
 - $O \rightarrow O.identifier (. A) , ./\$$
 - $A \rightarrow .A , identifier ,)/ ,$
 - $A \rightarrow .identifier ,)/ ,$
- I_{13} GOTO(I_8 , $identifier$)
 - $S \rightarrow S[identifier.] , [./\$$
- I_{14} GOTO(I_9 , $)$)
 - $O \rightarrow identifier (A) . , ./\$$
- I_{15} GOTO(I_9 , $,$)
 - $A \rightarrow A ,.identifier ,)/ ,$
- I_{16} GOTO(I_{12} , A)
 - $O \rightarrow O.identifier (A.) , ./\$$
 - $A \rightarrow A .,identifier ,)/ ,$
- I_{17} GOTO(I_{13} , $]$)
 - $S \rightarrow S[identifier] . , [./\$$
- I_{18} GOTO(I_{15} , $identifier$)
 - $A \rightarrow A ,identifier . ,)/ ,$
- I_{19} : GOTO(I_{16} , $)$)
 - $O \rightarrow O.identifier (A) , ./\$$

Table 2: Parsing Table LR(1) And LALR(1)

| States | Action | | | | | | | | GOTO | | | |
|--------|--------|------------|----|-----|-----|----|-----|-----|------|---|----|----|
| | this | identifier | . | (|) | [|] | , | \$ | O | S | A |
| 0 | s2 | s3 | | | | | | | | 1 | S | A |
| 1 | | | s4 | | | | | | acc | | | |
| 2 | | | r1 | | | | | | r1 | | | |
| 3 | | | | s6 | | | | | | | 5 | |
| 4 | | s7 | | | | | | | | | | |
| 5 | | | r2 | | | s8 | | | r2 | | | |
| 6 | | s10 | | | | | | | | | | 9 |
| 7 | | | | s12 | | | | | | | 11 | |
| 8 | | s13 | | | | | | | | | | |
| 9 | | | | | s14 | | | s15 | | | | |
| 10 | | | | | r8 | | | r8 | | | | |
| 11 | | | r3 | | | s8 | | | r3 | | | |
| 12 | | s10 | | | | | | | | | | 16 |
| 13 | | | | | | | s17 | | | | | |
| 14 | | | r4 | | | | | | r4 | | | |
| 15 | | s18 | | | | | | | | | | |
| 16 | | | | | s19 | | | s15 | | | | |
| 17 | | | r6 | | | r6 | | | r6 | | | |
| 18 | | | | | r7 | | | | r7 | | | |
| 19 | | | r5 | | | | | | r5 | | | |

Problem 3

No common cores hence table is same.

Problem 4

Table 3 shows the compact table.

Problem 5

The Table 4 shows the error recovery

1. e1 : identifier or this is expected.
2. e2 : . or end of program is expected.
3. e3 : (is expected.
4. e4 :) or , is expected.
5. e5 :] is expected.

Table 3: Compacted Parsing Table LALR(1)

| State | Symbol | Action |
|-------|------------|--------|
| 0 | this | s2 |
| | identifier | s3 |
| | any other | Error |
| 1 | . | s4 |
| | \$ | acc |
| | any other | Error |
| 2 | any | r1 |
| 3 | (| s6 |
| | any other | Error |
| 4 | identifier | s7 |
| | any other | Error |
| 5 | [| s8 |
| | any other | Error |
| 6,12 | identifier | s10 |
| | any other | Error |
| 7 | (| s12 |
| | any other | Error |
| 8 | identifier | s13 |
| | any other | Error |
| 9 |) | s14 |
| | , | s15 |
| | any other | Error |
| 10 | any | r8 |
| 11 | [| s8 |
| | any | r3 |
| 13 |] | s17 |
| | any other | Error |
| 14 | any | r4 |
| 15 | identifier | s18 |
| | any other | Error |
| 16 |) | s19 |
| | , | s15 |
| | any other | Error |
| 17 | any | r6 |
| 18 | any | r7 |
| 19 | any | r5 |

Table 4: Parsing Table LR(1) And LALR(1)

| States | Action | | | | | | | | | GOTO | | |
|--------|--------|------------|----|-----|-----|----|-----|-----|-----|------|----|----|
| | this | identifier | . | (|) | [|] | , | \$ | O | S | A |
| 0 | s2 | s3 | e1 | e1 | e1 | e1 | e1 | e1 | e1 | 1 | S | A |
| 1 | e2 | e2 | s4 | e2 | e2 | e2 | e2 | e2 | acc | | | |
| 2 | r1 | r1 | r1 | r1 | r1 | r1 | r1 | r1 | r1 | | | |
| 3 | e3 | e3 | e3 | s6 | e3 | e3 | e3 | e3 | e3 | | 5 | |
| 4 | e1 | s7 | e1 | e1 | e1 | e1 | e1 | e1 | | | | |
| 5 | r2 | r2 | r2 | r2 | r2 | s8 | r2 | r2 | r2 | | | |
| 6 | e1 | s10 | e1 | e1 | e1 | e1 | e1 | e1 | e1 | | | 9 |
| 7 | e3 | e3 | e3 | s12 | e3 | e3 | e3 | e3 | e3 | | 11 | |
| 8 | e1 | s13 | e1 | e1 | e1 | e1 | e1 | e1 | e1 | | | |
| 9 | e4 | e4 | e4 | e4 | s14 | e4 | e4 | s15 | e4 | | | |
| 10 | r8 | r8 | r8 | r8 | r8 | r8 | r8 | r8 | r8 | | | |
| 11 | r3 | r3 | r3 | r3 | r3 | s8 | r3 | r3 | r3 | | | |
| 12 | e1 | s10 | e1 | e1 | e1 | e1 | e1 | e1 | e1 | | | 16 |
| 13 | e5 | e5 | e5 | e5 | e5 | e5 | s17 | e5 | e5 | | | |
| 14 | r4 | r4 | r4 | r4 | r4 | r4 | r4 | r4 | r4 | | | |
| 15 | e1 | s18 | e1 | e1 | e1 | e1 | e1 | e1 | e1 | | | |
| 16 | e4 | e4 | e4 | e4 | s19 | e4 | e4 | s15 | e4 | | | |
| 17 | r6 | r6 | r6 | r6 | r6 | r6 | r6 | r6 | r6 | | | |
| 18 | r7 | r7 | r7 | r7 | r7 | r7 | r7 | r7 | r7 | | | |
| 19 | r5 | r5 | r5 | r5 | r5 | r5 | r5 | r5 | r5 | | | |