编译原理 第4次作业

Exercise 4.1

○ Given the following grammar

$$S \rightarrow (L) \mid a$$
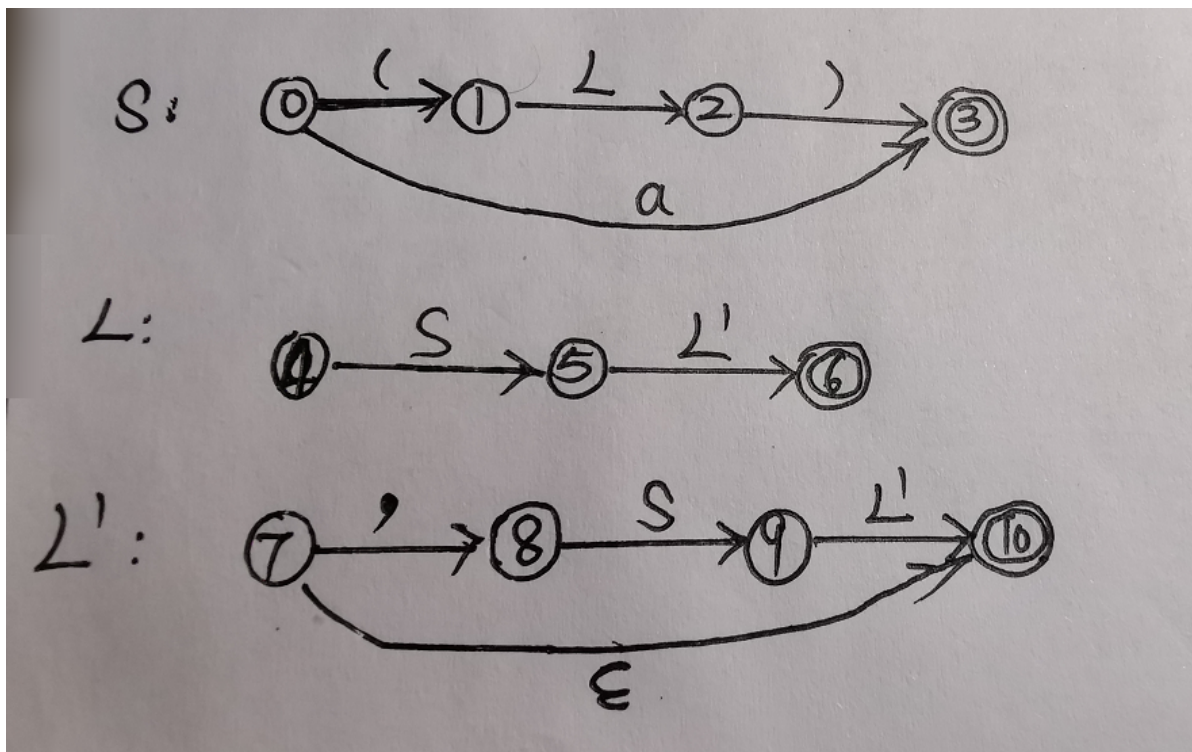$$L \rightarrow L, S \mid S$$

- Eliminate left recursions in the grammar.
- Draw the transition diagrams for the grammar.
- Write a recursive descent predictive parser.
- Indicate the procedure call sequence for an input sentence `(a, (a, a))`.

解:

1.消除左递归:

$$S \rightarrow (L) \mid a$$
$$L \rightarrow SL'$$
$$L' \rightarrow, SL' \mid \epsilon$$

2.转化图:

3.递归下降预测分析器:

```
1   void match(Token tok) {
2       if (lookahead == tok) {
3           lookahead = scanner.getNextToken();
4       } else error();
5   }
6
7   void S() {
8       if (lookahead == a) {
9           match(a);
10      } else if (lookahead == '(') {
11          match('(');
12          L();
13          match(')');
14      } else error();
15  }
16
17  void L() {
18      S();
19      L'();
20  }
21
22  void L'(){
23      if(lookahead == ','){
24          match(',');
25          S();
26          L'();
27      } else if(lookahead in FOLLOW(L') ){
28      } else error();
29  }
```

4.

Step	Matched	Stack	Input	Output	Action
1		$S\$$	$(a,(a,a))\$$	$S \to (L)$	derive
2		$(L)\$$	$(a,(a,a))\$$		match
3	$($	$L)\$$	$a,(a,a))\$$	$L \to SL'$	derive
4	$($	$SL')\$$	$a,(a,a))\$$	$S \to a$	derive
5	$($	$aL')\$$	$a,(a,a))\$$		match
6	$(a$	$L')\$$	$,(a,a))\$$	$L' \to, SL'$	derive
7	$(a$	$,SL')\$$	$,(a,a))\$$		match
8	$(a,$	$SL')\$$	$(a,a))\$$	$S \to (L)$	derive
9	$(a,$	$(L)L')\$$	$(a,a))\$$		match
10	$(a,($	$L)L')\$$	$a,a))\$$	$L \to SL'$	derive
11	$(a,($	$SL')L')\$$	$a,a))\$$	$S \to a$	derive
12	$(a,($	$aL')L')\$$	$a,a))\$$		match
13	$(a,(a$	$L')L')\$$	$,a))\$$	$L' \to, SL'$	derive
14	$(a,(a$	$,SL')L')\$$	$,a))\$$		match
15	$(a,(a,$	$SL')L')\$$	$a))\$$	$S \to a$	derive
16	$(a,(a,$	$aL')L')\$$	$a))\$$		match
17	$(a,(a,a$	$L')L')\$$	$))\$$	$L' \to \epsilon$	derive
18	$(a,(a,a$	$)L')\$$	$))\$$		match
19	$(a,(a,a)$	$L')\$$	$)\$$	$L' \to \epsilon$	derive
20	$(a,(a,a)$	$)\$$	$)\$$		match
21	$(a,(a,a))$	$\$$	$\$$		accept

Exercise 4.2

o Consider the context-free grammar

$$S \to a\,S\,b\,S \mid b\,S\,a\,S \mid \varepsilon$$

• Can you construct a predictive parser for the grammar? and why?

解：不能，因为这个语法有二义性。

Exercise 4.3

- ○ Compute the FIRST and FOLLOW for the start symbol of the following grammar

$$S \rightarrow S S + \mid S S * \mid a$$

解:

FIRST(S) = {a}

FOLLOW(S) = {a,+,*,$}