编译原理 第四次理论作业

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Exercise 4.1

Given the following grammar

S → (L) | **a**

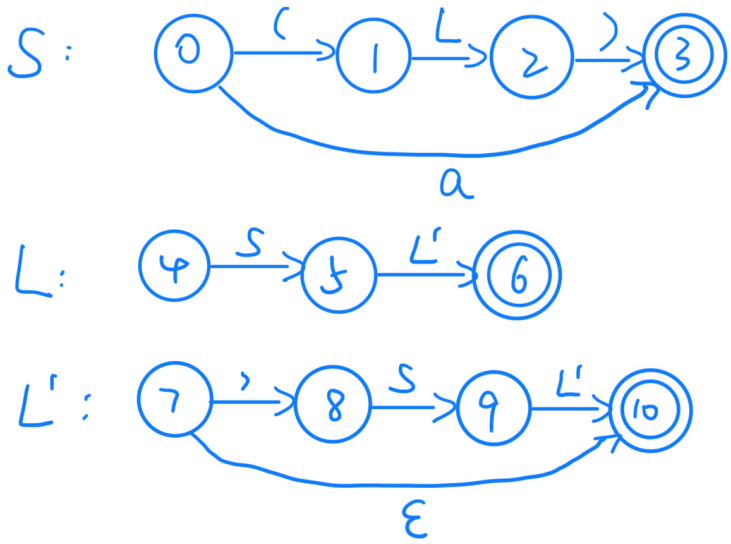
L → L , S | S

- 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))**.

1. 消除左递归如下：

$$
\begin{aligned}
S &\rightarrow (L) \mid a \\
L &\rightarrow SL' \\
L' &\rightarrow, SL' \mid \epsilon
\end{aligned}
$$

2.



3.

```
void match(Token tok) {
    if (lookahead == tok) {
        lookahead = scanner.getNextToken();
    } else error();
}
```

```
void S() throws SyntacticException {
    if (lookahead.equals(new Token('('))) {
        match(new Token('('));
        L();
        match(new Token(')'));
    } else if (lookahead.equals(new Token(a))) {
        match(new Token(a));
    } else {
        throw new SyntacticException();
    }
}
```

```
void L() throws SyntacticException {
    S();
    L`();
}
```

```
void L` () throws SyntacticException {
    if (lookahead.equals(new Token(','))){
        match(new Token(','));
        S();
        L`();
    } else if (lookahead in FOLLOW(L`)){
    }else {
        throw new SyntacticException();
    }
}
```

4.

Matched	Stack	Input	Action
	$S\$$	$(a,(a,a))\$$	
	$(L)\$$	$(a,(a,a))\$$	output $S \to (L)$
$($	$L)\$$	$a,(a,a))\$$	
$($	$SL')\$$	$a,(a,a))\$$	output $L \to SL'$
$($	$aL')\$$	$a,(a,a))\$$	output $S \to a$
$(a$	$L')\$$	$,(a,a))\$$	
$(a$	$,SL')\$$	$,(a,a))\$$	output $L' \to ,SL'$
$(a,$	$SL')\$$	$(a,a))\$$	
$(a,$	$(L)L')\$$	$(a,a))\$$	output $S \to (L)$
$(a,($	$L)L')\$$	$a,a))\$$	
$(a,($	$SL')L')\$$	$a,a))\$$	output $L \to SL'$
$(a,($	$aL')L')\$$	$a,a))\$$	output $S \to a$
$(a,(a$	$L')L')\$$	$,a))\$$	
$(a,(a$	$,SL')L')\$$	$,a))\$$	output $L' \to ,SL'$
$(a,(a,$	$SL')L')\$$	$a))\$$	
$(a,(a,$	$aL')L')\$$	$a))\$$	output $S \to a$
$(a,(a,a$	$L')L')\$$	$))\$$	
$(a,(a,a$	$)L')\$$	$))\$$	output $L' \to \epsilon$
$(a,(a,a)$	$L')\$$	$)\$$	
$(a,(a,a)$	$)\$$	$)\$$	output $L' \to \epsilon$
$(a,(a,a))$	$\$$	$\$$	

Exercise 4.2

Consider the context-free grammar S → **a** S **b** S | **b** S **a** S | ϵ

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

不能，因为这个语法有二义性且含有左递归。

Exercise 4.3

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

$S \rightarrow S\ S\ \mathbf{+} \mid S\ S\ * \mid \mathbf{a}$

FIRST(S) = {a}

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