

# 编译原理第四章作业(2)

151220129 计科 吴政亿

## 4.6.2

1. 增广文法:

$$(0) S' \rightarrow S$$

$$(1) S \rightarrow SS+$$

$$(2) B \rightarrow SS*$$

$$(3) B \rightarrow a$$

2. SLR项集如下:

- $I_0 : S' \rightarrow \cdot S, S \rightarrow \cdot SS+, S \rightarrow \cdot SS*, S \rightarrow \cdot a$
- $I_1 : S' \rightarrow a \cdot$
- $I_2 : S' \rightarrow S \cdot, S \rightarrow S \cdot S+, S \rightarrow S \cdot S*, S \rightarrow \cdot SS+, S \rightarrow \cdot SS*, S \rightarrow \cdot a$
- $I_3 : S' \rightarrow SS \cdot +, S \rightarrow SS \cdot *, S \rightarrow S \cdot S+, S \rightarrow S \cdot S*, S \rightarrow \cdot SS+, S \rightarrow \cdot SS*, S \rightarrow \cdot a$
- $I_4 : S' \rightarrow SS + \cdot$
- $I_5 : S' \rightarrow SS * \cdot$

3. GOTO 函数如下:

$$GOTO(I_0, a) = I_1, GOTO(I_0, S) = I_2$$

$$GOTO(I_2, a) = I_1, GOTO(I_2, S) = I_3, GOTO(I_2, \$) = accept$$

$$GOTO(I_3, a) = I_1, GOTO(I_3, S) = I_3$$

$$GOTO(I_3, +) = I_4, GOTO(I_3, *) = I_5$$

4. 语法分析表如下 :

状态	ACTION				GOTO
	a	+	*	\$	S

0	S1				2
1	r3	r3	r3	r3	
2	S1			accept	3
3	S1	S4	S5		3
4	r1	r1	r1	r1	
5	r2	r2	r2	r2	

无冲突，这显然是一个 SLR 文法

### 4.6.3

序号	栈	符号	输入	动作
(1)	0		aa*a+\$	移入
(2)	01	a	a*a+\$	按S->a规约
(3)	02	S	a*a+\$	移入
(4)	021	Sa	*a+\$	按S->a规约
(5)	023	SS	*a+\$	移入
(6)	0235	SS*	a+\$	按S->SS*规约
(7)	02	S	a+\$	移入
(8)	021	Sa	+\$	按S->a规约
(9)	023	SS	+\$	移入
(10)	0234	SS+	\$	按S->SS+规约
(11)	02	S	\$	接受

### 4.6.6

- 因为 $\text{First}(SA) = \text{First}(A) = \{a\}$ ，所以该文法不是LL(1)的。
- 下证该文法是SLR(1)的：

i. 增广文法：

$$(0) S' \rightarrow S$$

$$(1) S \rightarrow SA$$

$$(2) S \rightarrow A$$

$$(3) A \rightarrow a$$

ii. SLR项集:

- $I_0 : S' \rightarrow \cdot S, S \rightarrow \cdot SA, S \rightarrow \cdot A, A \rightarrow \cdot a$
- $I_1 : A \rightarrow a \cdot$
- $I_2 : S \rightarrow A \cdot$
- $I_3 : S' \rightarrow S \cdot, S \rightarrow S \cdot A, A \rightarrow \cdot a$
- $I_4 : S \rightarrow SA \cdot$

iii. 语法分析表:

状态	ACTION		GOTO	
	a	\$	S	A
0	S1		S2	S3
1	r3	r3		
2	r2	r2		
3	S!	acc		S4
4	r1	r1		

因为没有重复的冲突项，故该文法为SLR ( 1 ) 的。

## 4.7.1

### 1. 规范LR项集族

I0:

[S' -> ·S , \$]  
[S' -> ·SS+, \$], [S' -> ·SS+, a]  
[S' -> ·SS\*, \$], [S' -> ·SS\*, a]  
[S' -> ·a , \$], [S' -> ·a , a]

I1:

[S' -> a· , \$], [S' -> a· , a]

I2:

[S' -> S· , \$]  
[S' -> S·S+, \$], [S' -> S·S+, a]  
[S' -> S·S\*, \$], [S' -> S·S\*, a]  
[S' -> ·SS+, a], [S' -> ·SS+, \*], [S' -> ·SS+, +]  
[S' -> ·SS\*, a], [S' -> ·SS\*, \*], [S' -> ·SS\*, +]  
[S' -> ·a , a], [S' -> ·a , \*], [S' -> ·a , +]

I3:

[S' -> a· , a], [S' -> a· , \*], [S' -> a· , +]

I4:

[S' -> SS·+, \$], [S' -> SS·+, a]  
[S' -> SS·\*, \$], [S' -> SS·\*, a]  
[S' -> S·S+, a], [S' -> S·S+, \*], [S' -> S·S+, +]  
[S' -> S·S\*, a], [S' -> S·S\*, \*], [S' -> S·S\*, +]  
[S' -> ·SS+, a], [S' -> ·SS+, \*], [S' -> ·SS+, +]  
[S' -> ·SS\*, a], [S' -> ·SS\*, \*], [S' -> ·SS\*, +]  
[S' -> ·a , a], [S' -> ·a , \*], [S' -> ·a , +]

I5:

[S' -> SS+·, \$], [S' -> SS+·, a]

I6:

[S' -> SS\*·, \$], [S' -> SS\*·, a]

I7:

[S' -> SS·+, a], [S' -> SS·+, \*], [S' -> SS·+, +]  
[S' -> SS·\*, a], [S' -> SS·\*, \*], [S' -> SS·\*, +]  
[S' -> S·S+, a], [S' -> S·S+, \*], [S' -> S·S+, +]  
[S' -> S·S\*, a], [S' -> S·S\*, \*], [S' -> S·S\*, +]  
[S' -> ·SS+, a], [S' -> ·SS+, \*], [S' -> ·SS+, +]  
[S' -> ·SS\*, a], [S' -> ·SS\*, \*], [S' -> ·SS\*, +]  
[S' -> ·a , a], [S' -> ·a , \*], [S' -> ·a , +]

I8:

[S' -> SS+·, a], [S' -> SS+·, \*], [S' -> SS+·, +]

I9:

[S' -> SS\*·, a], [S' -> SS\*·, \*], [S' -> SS\*·, +]

## 2. LALR项集族:

I0:

[S' -> ·S , \$]  
[S' -> ·SS+, \$], [S' -> ·SS+, a]  
[S' -> ·SS\*, \$], [S' -> ·SS\*, a]  
[S' -> ·a , \$], [S' -> ·a , a]

I1:

[S' -> S· , \$]  
[S' -> S·S+, \$], [S' -> S·S+, a]  
[S' -> S·S\*, \$], [S' -> S·S\*, a]  
[S' -> ·SS+, a], [S' -> ·SS+, \*], [S' -> ·SS+, +]  
[S' -> ·SS\*, a], [S' -> ·SS\*, \*], [S' -> ·SS\*, +]  
[S' -> ·a , a], [S' -> ·a , \*], [S' -> ·a , +]

I2:

[S' -> SS·+, a], [S' -> SS·+, \*], [S' -> SS·+, +], [S' -> SS·+, \$]  
[S' -> SS·\*, a], [S' -> SS·\*, \*], [S' -> SS·\*, +], [S' -> SS·\*, \$]  
[S' -> S·S+, a], [S' -> S·S+, \*], [S' -> S·S+, +]  
[S' -> S·S\*, a], [S' -> S·S\*, \*], [S' -> S·S\*, +]  
[S' -> ·SS+, a], [S' -> ·SS+, \*], [S' -> ·SS+, +]  
[S' -> ·SS\*, a], [S' -> ·SS\*, \*], [S' -> ·SS\*, +]  
[S' -> ·a , a], [S' -> ·a , \*], [S' -> ·a , +]

I3:

[S' -> a· , a], [S' -> a· , \*], [S' -> a· , +], [S' -> a· , \$]

I4:

[S' -> SS+·, a], [S' -> SS+·, \*], [S' -> SS+·, +], [S' -> SS+·, \$]

I5:

[S' -> SS\*·, a], [S' -> SS\*·, \*], [S' -> SS\*·, +], [S' -> SS\*·, \$]