

编译原理(2)

2021年10月12日 20:21

2019211963 蒋泽宇

4.1 为了方便令 $bexpr = E$, $bterm = T$, $bfactor = F$

消除左递归:

$E \rightarrow TE'$

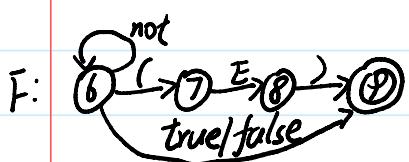
$E' \rightarrow or TE' | \epsilon$

$T \rightarrow FT'$

$T' \rightarrow and FT' | \epsilon$

$F \rightarrow not F | (E) | true | false$

写出简化状态转移图:



递归调用分析程序:

```
2 void procE() {
3     procT();
4     if (*ptr == "or") {
5         ptr++;
6         procT();
7     }
8 }
9
10 void procT() {
11     procF();
12     if (*ptr == "and") {
13         ptr++;
14         procT();
15     }
16 }
17
18 void procF() {
19     if (*ptr == "not") {
20         ptr++;
21         procF();
22     } else if (*ptr == "(") {
23         ptr++;
24         procE();
25         if (*ptr == ")") {
26             ptr++;
27         } else {
28             error();
29         }
30     } else if (*ptr == "true" || *ptr == "false") {
31         ptr++;
32     } else {
33         error();
34     }
35 }
```

4.3

$$(1) \text{FIRST}(A) = \{(), \epsilon\}, \text{FOLLOW}(A) = \{(), \$\}$$

$$(2) ① \text{FIRST}((A)A) \cap \text{FIRST}(\epsilon) = \emptyset$$

$$② \text{FIRST}((A)A) \cap \text{FOLLOW}(A) = \emptyset$$

故 G 为 LL(1) 文法

4.5

$$(1) E \rightarrow A \mid B$$

$$A \rightarrow \text{num} \mid \text{id}$$

$$B \rightarrow (L)$$

$$L \rightarrow EL'$$

$$L' \rightarrow EL' \mid \epsilon$$

$$(2) \text{FIRST}(E) = \{\text{num}, \text{id}, ()\}, \text{FOLLOW}(E) = \{\$, \text{num}, \text{id}, (), ()\}$$

$$\text{FIRST}(A) = \{\text{num}, \text{id}\}, \text{FOLLOW}(A) = \text{FOLLOW}(E)$$

$$\text{FIRST}(B) = \{()\} \quad \text{FOLLOW}(B) = \text{FOLLOW}(E)$$

$$\text{FIRST}(L) = \{\text{num}, \text{id}, ()\} \quad \text{FOLLOW}(L) = \{()\}$$

$$\text{FIRST}(L') = \{\text{num}, \text{id}, (), \epsilon\}, \text{FOLLOW}(L') = \{()\}$$

$$(3) \text{对 } E \rightarrow A \mid B, \text{FIRST}(A) \cap \text{FIRST}(B) = \emptyset$$

$$A \rightarrow \text{num} \mid \text{id}, \text{FIRST}(\text{num}) \cap \text{FIRST}(\text{id}) = \emptyset$$

$$L' \rightarrow EL' \mid \epsilon, \text{FIRST}(EL') \cap \text{FIRST}(\epsilon) = \emptyset \text{ 且 } \text{FIRST}(EL') \cap \text{FOLLOW}(L') = \emptyset$$

故 G 是 LL(1) 文法.

num id () \$

$$E \quad E \rightarrow A \quad E \rightarrow A \quad E \rightarrow B$$

$$A \quad A \rightarrow \text{num} \quad A \rightarrow \text{id}$$

$$B \rightarrow (L)$$

$$L \quad L \rightarrow EL' \quad L \rightarrow EL' \quad L \rightarrow EL'$$

$$L' \quad L' \rightarrow EL' \quad L' \rightarrow EL' \quad L' \rightarrow EL' \quad L \rightarrow \epsilon$$

(4)

| 栈 | 输入 | 输出 | 左句型 |
|--------|----------------|--------|-------|
| \$E | (a(b(2))(c))\$ | | E |
| \$B | (a(b(2))(c))\$ | E->B | B |
| \$)L(| (a(b(2))(c))\$ | B->(L) | (L) |
| \$)L | a(b(2))(c)\$ | | (L) |
| \$)L'E | a(b(2))(c)\$ | L->EL' | (EL') |
| \$)L'A | a(b(2))(c)\$ | E->A | (AL') |

(4)

| 栈 | 输入 | 输出 | 左句型 |
|----------------|----------------|---------|-----------------------|
| \$E | (a(b(2))(c))\$ | | E |
| \$B | (a(b(2))(c))\$ | E->B | B |
| \$)L(| (a(b(2))(c))\$ | B->(L) | (L) |
| \$)L | a(b(2))(c))\$ | | (L) |
| \$)L'E | a(b(2))(c))\$ | L->EL' | (EL') |
| \$)L'A | a(b(2))(c))\$ | E->A | (AL') |
| \$)L'id | a(b(2))(c))\$ | A->id | (idL') |
| \$)L' | (b(2))(c))\$ | | (idL') |
| \$)L'E | (b(2))(c))\$ | L'->EL' | (idEL') |
| \$)L'B | (b(2))(c))\$ | E->B | (idBL') |
| \$)L')L(| (b(2))(c))\$ | B->(L) | (id(L)L') |
| \$)L')L | b(2))(c))\$ | | (id(L)L') |
| \$)L')L'E | b(2))(c))\$ | L->EL' | (id(EL')L') |
| \$)L')L'A | b(2))(c))\$ | E->A | (id(AL')L') |
| \$)L')L'id | b(2))(c))\$ | A->id | (id(idL')L') |
| \$)L')L' | (2))(c))\$ | | (id(idL')L') |
| \$)L')L'E | (2))(c))\$ | L'->EL' | (id(idEL')L') |
| \$)L')L'B | (2))(c))\$ | E->B | (id(idBL')L') |
| \$)L')L')L(| (2))(c))\$ | B->(L) | (id(id(L)L')L') |
| \$)L')L')L | 2))(c))\$ | | (id(id(L)L')L') |
| \$)L')L')L'E | 2))(c))\$ | L->EL' | (id(id(EL')L')L') |
| \$)L')L')L'A | 2))(c))\$ | E->A | (id(id(AL')L')L') |
| \$)L')L')L'num | 2))(c))\$ | A->num | (id(id(numL')L')L') |
| \$)L')L')L' |)())(\$ | | (id(id(numL')L')L') |
| \$)L')L') |)())(\$ | L'->ε | (id(id(numL')L')L') |
| \$)L')L' |)())(\$ | | (id(id(numL')L')L') |
| \$)L') |)())(\$ | L'->ε | (id(id(num))L') |
| \$)L' | (c))\$ | | (id(id(num))L') |
| \$)L'E | (c))\$ | L'->EL' | (id(id(num))EL') |
| \$)L'B | (c))\$ | E->B | (id(id(num))BL') |
| \$)L')L(| (c))\$ | B->(L) | (id(id(num))(L)L') |
| \$)L')L | c))\$ | | (id(id(num))(L)L') |
| \$)L')L'E | c))\$ | L->EL' | (id(id(num))(EL')L') |
| \$)L')L'A | c))\$ | E->A | (id(id(num))(AL')L') |
| \$)L')L'id | c))\$ | A->id | (id(id(num))(idL')L') |
| \$)L')L' |)())\$ | | (id(id(num))(idL')L') |
| \$)L') |)())\$ | L'->ε | (id(id(num))(id)L') |
| \$)L' |)())\$ | | (id(id(num))(id)L') |
| \$) |)())\$ | L'->ε | (id(id(num))(id)) |
| \$ | \$ | | (id(id(num))(id)) |