

中间代码生成

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布尔表达式的中间代码翻译

产生式	语义规则
$B \rightarrow B_1 \ \ B_2$	$B_1.true = B.true$ $B_1.false = newlabel()$ $B_2.true = B.true$ $B_2.false = B.false$ $B.code = B_1.code \ \ label(B_1.false) \ \ B_2.code$
$B \rightarrow B_1 \ \&\& \ B_2$	$B_1.true = newlabel()$ $B_1.false = B.false$ $B_2.true = B.true$ $B_2.false = B.false$ $B.code = B_1.code \ \ label(B_1.true) \ \ B_2.code$
$B \rightarrow ! B_1$	$B_1.true = B.false$ $B_1.false = B.true$ $B.code = B_1.code$
$B \rightarrow E_1 \ rel \ E_2$	$B.code = E_1.code \ \ E_2.code$ $\quad \ \ gen('if' \ E_1.addr \ rel \ op \ E_2.addr \ 'goto' \ B.true)$ $\quad \ \ gen('goto' \ B.false)$
$B \rightarrow true$	$B.code = gen('goto' \ B.true)$
$B \rightarrow false$	$B.code = gen('goto' \ B.false)$

$B \rightarrow \text{true}$ $B.\text{code} = \text{gen}(\text{'goto' } B.\text{true})$

$B \rightarrow \text{false}$ $B.\text{code} = \text{gen}(\text{'goto' } B.\text{false})$

if (true) assign

$S \rightarrow \text{if}(B) S_1$ $\begin{cases} B.\text{true} = \text{newlabel}() \\ B.\text{false} = S_1.\text{next} = S.\text{next} \\ S.\text{code} = B.\text{code} || \text{label}(B.\text{true}) || S_1.\text{code} \end{cases}$

if (false) assign

$$B \rightarrow ! B_1$$
$$\left| \begin{array}{l} B_1.true = B.false \\ B_1.false = B.true \\ B.code = B_1.code \end{array} \right.$$

if (!true) assign

$$S \rightarrow \text{if} (B) S_1$$
$$\left| \begin{array}{l} B.true = \text{newlabel}() \\ B.false = S_1.next = S.next \\ S.code = B.code || \text{label}(B.true) || S_1.code \end{array} \right.$$

if (!false) assign

短路求值

$$B \rightarrow B_1 \ || \ B_2 \quad \left| \begin{array}{l} B_1.true = B.true \\ B_1.false = newlabel() \\ B_2.true = B.true \\ B_2.false = B.false \\ B.code = B_1.code \ || \ label(B_1.false) \ || \ B_2.code \end{array} \right.$$

if (true || false) assign

$$S \rightarrow \text{if} (B) S_1 \quad \left| \begin{array}{l} B.true = newlabel() \\ B.false = S_1.next = S.next \\ S.code = B.code \ || \ label(B.true) \ || \ S_1.code \end{array} \right.$$

if (false || true) assign

短路求值

$$B \rightarrow B_1 \ \&\& \ B_2 \quad \left| \begin{array}{l} B_1.true = newlabel() \\ \boxed{B_1.false} = B.false \\ B_2.true = B.true \\ \boxed{B_2.false} = B.false \\ B.code = B_1.code \ || \ label(B_1.true) \ || \ B_2.code \end{array} \right.$$

if (true && false) assign

$$S \rightarrow \text{if} (B) S_1 \quad \left| \begin{array}{l} B.true = newlabel() \\ B.false = \boxed{S_1.next} = S.next \\ S.code = B.code \ || \ label(B.true) \ || \ S_1.code \end{array} \right.$$

if (false && true) assign

$$B \rightarrow E_1 \text{ rel } E_2 \quad \left| \quad \begin{array}{l} B.\text{code} = E_1.\text{code} \parallel E_2.\text{code} \\ \parallel \text{gen}('if' \ E_1.\text{addr} \ \text{rel.op} \ E_2.\text{addr} \ 'goto' \ B.\text{true}) \\ \parallel \text{gen}('goto' \ B.\text{false}) \end{array} \right.$$

```
if (x < 100 || x > 200 && x != y) x = 0;
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```
        if x < 100 goto L2  
        goto L3  
L3:    if x > 200 goto L4  
        goto L1  
L4:    if x != y goto L2  
        goto L1  
L2:    x = 0  
L1:
```


布尔表达式的作用: 布尔值 *vs.* 控制流跳转

$S \rightarrow \text{id} = E ; \mid \text{if} (E) S \mid \text{while} (E) S \mid S S$

$E \rightarrow E \parallel E \mid E \&\& E \mid E \text{ rel } E \mid E + E \mid (E) \mid \text{id} \mid \text{true} \mid \text{false}$

函数 $\text{jump}(t, f)$: 生成控制流代码

函数 $\text{rvalue}()$: 生成计算布尔值的代码, 并将结果存储在临时变量中

产生式	语义规则
$S \rightarrow id = E ;$	$S.code = E.code \parallel$ $gen(top.get(id.lexeme) '=' E.addr)$
$E \rightarrow E_1 + E_2$	$E.addr = new Temp()$ $E.code = E_1.code \parallel E_2.code \parallel$ $gen(E.addr '=' E_1.addr '+' E_2.addr)$
$ - E_1$	$E.addr = new Temp()$ $E.code = E_1.code \parallel$ $gen(E.addr '=' 'minus' E_1.addr)$
$ (E_1)$	$E.addr = E_1.addr$ $E.code = E_1.code$
$ id$	$E.addr = top.get(id.lexeme)$ 符号表条目 $E.code = ''$

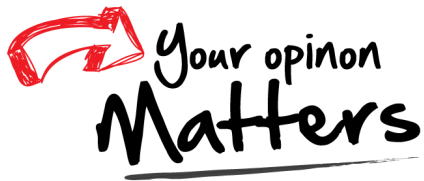
$$E \rightarrow E_1 \&\& E_2$$

为 E 生成跳转代码, 在真假出口处将 true 或 false 存储到临时变量

`x = a < b && c < d`

```
    ifFalse a < b goto L1
    ifFalse c < d goto L1
    t = true
    goto L2
L1: t = false
L2: x = t
```

Thank
You!



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