

CS3005D Compiler Design

Winter 2024

Lecture #28

Translation of Boolean Expressions, while loop

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Translation of *while* loop: example

while ($i < 10$) $i = i + 1$

L_1 : if $i < 10$ goto L_2

goto L_3

L_2 : $t_1 = i + 1$

$i = t_1$

goto L_1

L_3 :

Translation of *while* loop

Production	Semantic Rules
$S \rightarrow \text{while } (B) S_1$	$\begin{aligned} &begin = \text{newLabel}() \\ &B.true = \text{newLabel}() \\ &B.false = S.next \\ &S_1.next = begin \\ &S.code = \text{label}(begin) \parallel B.code \parallel \text{label}(B.true) \\ &\parallel S_1.code \parallel \text{gen}('goto' \text{ } begin) \end{aligned}$

Translation of other Boolean Expressions

Production	Semantic Rules
$B \rightarrow B_1 \parallel B_2$	$B_1.true = B.true$ $B_1.false = newLabel()$ $B_2.true = B.true$ $B_2.false = B.false$ $B.code = B_1.code \parallel label(B_1.false) \parallel B_2.code$
$B \rightarrow B_1 \&\& B_2$	$B_1.true = newLabel()$ $B_1.false = B.false$ $B_2.true = B.true$ $B_2.false = B.false$ $B.code = B_1.code \parallel label(B_1.true) \parallel B_2.code$
$B \rightarrow !B_1$	$B_1.true = B.false$ $B_1.false = B.true$ $B.code = B_1.code$

Exercise

Write the 3-address code generated for the following instruction, as per the given SDD:

```
while (i < 10 && sum < 100)  
    sum = sum + i  
    i = i + 1
```

References

References:

- Aho A.V., Lam M.S., Sethi R., and Ullman J.D. Compilers: Principles, Techniques, and Tools (ALSU). Pearson Education, 2007.

Further reading:

- ALSU Section 6.6