

COMP0174 Practical Program Analysis

The While Language

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The While Language

- Simple language for studying analyses
- A While program is a statement (or a sequence of statements)
- Elementary blocks (assignments, tests and *skip* statements) are labelled

Syntactic Categories

$a \in AExp$ – arithmetic expressions

$b \in BExp$ – boolean expressions

$S \in Stmt$ – statements

$x, y \in Var$ – variables

$n \in Num$ – numerals

$l \in Lab$ – labels

$op_a \in Op_a$ – arithmetic operators

$op_b \in Op_b$ – boolean operators

$op_r \in Op_r$ – relational operators

Syntax

$a ::= x \mid n \mid a_1 \text{ op}_a a_2$

$b ::= \text{true} \mid \text{false} \mid \text{not } b \mid b_1 \text{ op}_b b_2 \mid a_1 \text{ op}_r a_2$

$S ::= [x := a]^l \mid [\text{skip}]^l \mid S_1; S_2$
 $\quad \mid \text{if } [b]^l \text{ then } S_1 \text{ else } S_2 \mid \text{while } [b]^l \text{ do } S$

a = Arithmetic expression

b = Boolean expression

S = Statement (program)

$[...]^l \rightarrow$ elementary block

$^l \rightarrow$ label allows to identify the primitive constructs of a program

Example Program (Factorial)

```
[y := x]1;  
[z := 1]2;  
while [y > 1]3 do  
  ([z := z * y]4;  
   [y := y - 1]5);  
[y := 0]6
```