

# G54FOP: Lecture 5

## Operational Semantics II: Induction on Derivations

Henrik Nilsson  
University of Nottingham, UK

G54FOP: Lecture 5 – p.15

### Extension: Small Expression Language

$t \rightarrow$

...		<i>terms:</i>
	0	constant zero
	succ $t$	successor
	pred $t$	predecessor
	iszero $t$	zero test

G54FOP: Lecture 5 – p.45

### Recap: Language Booleans (1)

$t \rightarrow$

	<b>true</b>	<i>terms:</i>
	<b>false</b>	constant true
	<b>if <math>t</math> then <math>t</math> else <math>t</math></b>	constant false
		conditional

$v \rightarrow$

	<b>true</b>	<i>values:</i>
	<b>false</b>	constant true
		constant false

G54FOP: Lecture 5 – p.25

### Extension: Small Expression Language

$v \rightarrow$

...		<i>values:</i>
	$nv$	numeric value

$nv \rightarrow$

	0	<i>numeric values:</i>
	succ $nv$	zero value
		successor value

G54FOP: Lecture 5 – p.55

### Recap: Language Booleans (2)

**if true then  $t_2$  else  $t_3$**   $\rightarrow t_2$  (E-IFTRUE)

**if false then  $t_2$  else  $t_3$**   $\rightarrow t_3$  (E-IFFALSE)

$$\frac{t_1 \rightarrow t'_1}{\text{if } t_1 \text{ then } t_2 \text{ else } t_3 \rightarrow \text{if } t'_1 \text{ then } t_2 \text{ else } t_3}$$
 (E-IF)

Note:

- Computation rules: E-IFTRUE and E-IFFALSE
- Congruence rules: E-IF
- Values cannot be evaluated further.

G54FOP: Lecture 5 – p.35