University of Massachusetts Lowell — Comp 3010: Organization of Programming Languages

Assignment 2

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Inference rules:
$\langle n, \sigma \rangle \rightarrow_a n$
$\langle a_1, \sigma \rangle \rightarrow_a a_1' \; \langle a_1 + a_2, \sigma \rangle \rightarrow_a a_1' + a_2$
$\langle a_2, \sigma \rangle \rightarrow_a a_2' \; \langle n_1 + a_2, \sigma \rangle \rightarrow_a n_1 + a_2'$
$\langle n_1 + n_2, \sigma \rangle \rightarrow_a n_3$ where n_3 is the sum of n_1 and n_2
$\langle a_1, \sigma \rangle \rightarrow_a a_1' \; \langle a_1 \times a_2, \sigma \rangle \rightarrow_a a_1' \times a_2$
$\langle a_2, \sigma \rangle \rightarrow_a a_2' \; \langle n_1 \times a_2, \sigma \rangle \rightarrow_a n_1 \times a_2'$
$\langle n_1 \times n_2, \sigma \rangle \rightarrow_a n_3$ where n_3 is the product of n_1 and n_2

(b) Small-step semantics for boolean expressions

Configuration: $\langle b, \sigma \rangle$, where b is a boolean expression and σ is the store.
Inference rules:
$\langle \text{true}, \sigma \rangle \rightarrow_b$ true
$\langle \text{false}, \sigma \rangle \rightarrow_b$ false
$\langle a_1, \sigma \rangle \rightarrow_a a_1' \; \langle a_1 = a_2, \sigma \rangle \rightarrow_b a_1' = a_2$
$\langle a_2, \sigma \rangle \rightarrow_a a_2' \; \langle n_1 = a_2, \sigma \rangle \rightarrow_b n_1 = a_2'$
$\langle n_1 = n_2, \sigma \rangle \rightarrow_b$ true if $n_1 = n_2$
$\langle n_1 = n_2, \sigma \rangle \rightarrow_b$ false if $n_1 \neq n_2$
$\langle a_1, \sigma \rangle \rightarrow_a a_1' \; \langle a_1 \neq a_2, \sigma \rangle \rightarrow_b a_1' \neq a_2$
$\langle a_2, \sigma \rangle \rightarrow_a a_2' \; \langle n_1 \neq a_2, \sigma \rangle \rightarrow_b n_1 \neq a_2'$
$\langle n_1 \neq n_2, \sigma \rangle \rightarrow_b$ true if $n_1 \neq n_2$
$\langle n_1 \neq n_2, \sigma \rangle \rightarrow_b$ false if $n_1 = n_2$
$\langle a_1, \sigma \rangle \rightarrow_a a_1' \; \langle a_1 \leq a_2, \sigma \rangle \rightarrow_b a_1' \leq a_2$
$\langle a_2, \sigma \rangle \rightarrow_a a_2' \; \langle n_1 \leq a_2, \sigma \rangle \rightarrow_b n_1 \leq a_2'$
$\langle n_1 \leq n_2, \sigma \rangle \rightarrow_b$ true if $n_1 \leq n_2$
$\langle n_1 \leq n_2, \sigma \rangle \rightarrow_b$ false if $n_1 \rangle n_2$
$\langle a_1, \sigma \rangle \rightarrow_a a_1' \; \langle a_1 \rangle a_2, \sigma \rangle \rightarrow_b a_1' \rangle a_2$
$\langle a_2, \sigma \rangle \rightarrow_a a_2' \; \langle n_1 \rangle a_2, \sigma \rangle \rightarrow_b n_1 \rangle a_2'$
$\langle n_1 \rangle n_2, \sigma \rangle \rightarrow_b$ true if $n_1 \rangle n_2$
$\langle n_1 \rangle n_2, \sigma \rangle \rightarrow_b$ false if $n_1 \leq n_2$
$\langle b, \sigma \rangle \rightarrow_b b' \; \langle \neg b, \sigma \rangle \rightarrow_b \neg b'$
$\langle \neg \text{true}, \sigma \rangle \rightarrow_b$ false
$\langle \neg \text{false}, \sigma \rangle \rightarrow_b$ true
$\langle b_1, \sigma \rangle \rightarrow_b b_1' \; \langle b_1 \&\& b_2, \sigma \rangle \rightarrow_b b_1' \&\& b_2$
$\langle \text{true} \&\& b, \sigma \rangle \rightarrow_b b$
$\langle \text{false} \&\& b, \sigma \rangle \rightarrow_b$ false