Regole di inferenza

Semantica big-step

$$\textbf{B-Num}\frac{-}{\langle n, s\rangle \Downarrow n}$$

$$\textbf{B-Loc}\frac{-}{\langle l, s\rangle \Downarrow s(l)}$$

$$\textbf{B-Skip}\frac{-}{\langle skip, s\rangle \Downarrow s}$$

$$\textbf{B-Add}\frac{\langle E_1, s\rangle \Downarrow n_1 \quad \langle E_2, s\rangle \Downarrow n_2}{\langle E_1 + E_2\rangle \Downarrow n_3} n_3 = add(n_1, n_2)$$

$$\textbf{B-Assign}\frac{\langle E, s\rangle \Downarrow n}{\langle l := e, s\rangle \Downarrow s[l \mapsto n]}$$

$$\textbf{B-Assign.s}\frac{\langle E, s\rangle \Downarrow n}{\langle l := e, s\rangle \Downarrow \langle skip, s[l \mapsto n]\rangle}$$

$$\textbf{B-Seq}\frac{\langle C_1, s\rangle \Downarrow s_1 \quad \langle C_2, s_1\rangle \Downarrow s'}{\langle C_1; C_2, s\rangle \Downarrow s'}$$

$$\textbf{B-Seq.s}\frac{\langle C_1, s\rangle \Downarrow \langle skip, s_1\rangle \quad \langle C_2, s_1\rangle \Downarrow \langle r, s'\rangle}{\langle C_1; C_2, s\rangle \Downarrow \langle r, s'\rangle}$$

$$\textbf{B-If.T}\frac{\langle B, s\rangle \Downarrow true \quad \langle C_1, s\rangle \Downarrow s'}{\langle \text{if } B \text{ then } C_1 \text{ else } C_2, s\rangle \Downarrow \langle r, s\rangle}$$

$$\textbf{B-If.T}\frac{\langle B, s\rangle \Downarrow false \quad \langle C_2, s\rangle \Downarrow s'}{\langle \text{if } B \text{ then } C_1 \text{ else } C_2, s\rangle \Downarrow \langle r, s\rangle}$$

Semantica small-step

$$\textbf{S-Left}\ \frac{E_1 \rightarrow E_1'}{E_1 + E_2 \rightarrow E_1' + E_2}$$

$$\textbf{S-N.Right}\ \frac{E_2 \rightarrow E_2'}{n_1 + E_2 \rightarrow n_1 + E_2'}$$

$$\textbf{S-Add}\ \frac{-}{n_1 + n_2 \rightarrow n_3}\ n_3 = add(n_1, n_2)$$

$$\textbf{S-Left}\ \frac{E_1 \rightarrow_{ch} E_1'}{E_1 + E_2 \rightarrow_{ch} E_1' + E_2}$$

$$\textbf{S-Right}\ \frac{E_2 \rightarrow_{ch} E_2'}{E_1 + E_2 \rightarrow_{ch} E_1 + E_2'}$$

$$\textbf{op+}\ \frac{-}{\langle n_1 + n_2, s\rangle \rightarrow \langle n, s\rangle}\ n = add(n_1, n_2)$$

$$\textbf{op-geq}\ \frac{-}{\langle n_1 \geq n_2, s\rangle \rightarrow \langle b, s\rangle}\ b = geq(n_1, n_2)$$

$$\textbf{op1}\ \frac{\langle e_1, s\rangle \rightarrow \langle e_1', s'\rangle}{\langle e_1 + e_2, s\rangle \rightarrow \langle e_1' + e_2, s'\rangle}$$

$$\textbf{op2}\ \frac{\langle e_2, s\rangle \rightarrow \langle e_2', s'\rangle}{\langle v + e_2, s\rangle \rightarrow \langle v + e_2', s\rangle}$$

$$\textbf{op1b}\ \frac{\langle e_2, s\rangle \rightarrow \langle e_2', s'\rangle}{\langle e_1 + e_2, s\rangle \rightarrow \langle e_1 + e_2', s'\rangle}$$

$$\textbf{op2b}\ \frac{\langle e_1, s\rangle \rightarrow \langle e_1', s'\rangle}{\langle e_1 + v, s\rangle \rightarrow \langle e_1' + v', s'\rangle}$$

$$\textbf{deref1}\ \frac{-}{\langle !l, s\rangle \rightarrow \langle v, s\rangle}\ \text{if } l \in dom(s) \wedge s(l) = v$$

$$\textbf{deref2}\ \frac{\langle e, s\rangle \rightarrow \langle e', s'\rangle}{\langle !e, s\rangle \rightarrow \langle !e', s'\rangle}$$

$$\textbf{ref1}\ \frac{-}{\langle \text{ref } v, s\rangle \rightarrow \langle l, s[l \mapsto v]\rangle}\ l \notin dom(s)$$

$$\textbf{ref2}\ \frac{\langle e, s\rangle \rightarrow \langle e', s'\rangle}{\langle \text{ref } e, s\rangle \rightarrow \langle \text{ref } e', s\rangle}$$

$$\textbf{assign1}\ \frac{-}{\langle l := v, s\rangle \rightarrow \langle \text{skip}, s[l \mapsto v]\rangle}\ \text{if } l \in dom(s)$$

$$\textbf{assign2}\ \frac{\langle e, s\rangle \rightarrow \langle e', s'\rangle}{\langle l := e, s\rangle \rightarrow \langle l := e', s\rangle}$$

$$\textbf{assign3}\ \frac{\langle e_1, s\rangle \rightarrow \langle e_1', s'\rangle}{\langle e_1 := e_2, s\rangle \rightarrow \langle e_1' := e_2, s'\rangle}$$

$$\textbf{if-tt}\ \frac{-}{\langle \text{if } true \text{ then } e_1 \text{ else } e_2, s\rangle \rightarrow \langle e_1, s\rangle}$$

$$\textbf{if-ff}\ \frac{-}{\langle \text{if} false \text{then} e_1 \text{else} e_2, s\rangle \rightarrow \langle e_2, s\rangle}$$

$$\textbf{if}\ \frac{\langle e, s\rangle \rightarrow \langle e', s'\rangle}{\langle \text{if } e \text{ then } e_1 \text{ else } e_2, s\rangle \rightarrow \langle \text{if } e' \text{ then } e_1 \text{ else } e_2, s\rangle}$$

$$\textbf{while}\ \frac{-}{\langle \text{while } e \text{ do } e_1, s\rangle \rightarrow \langle \text{if } e \text{ then } (e_1; \text{while } e \text{ do } e_1) \text{ else } skip, s\rangle}$$

$$\textbf{assign1b}\ \frac{-}{\langle l := n, s\rangle \rightarrow \langle n, s[l \mapsto n]\rangle}\ l \in dom(s)$$

$$\textbf{seq.skip}\ \frac{-}{\langle skip; e_2, s\rangle \rightarrow \langle e_2, s\rangle}$$

$$\textbf{seq}\ \frac{\langle e_1, s\rangle \rightarrow \langle e_1', s\rangle}{\langle e_1; e_2, s\rangle \rightarrow \langle e_1'; e_2, s'\rangle}$$

$$\textbf{seq.skipb}\ \frac{-}{\langle v; e_2, s\rangle \rightarrow \langle e_2, s\rangle}$$