
CS 421 --- Big Step Semantics Rules

Expression Rules

$$\frac{}{\langle i, \sigma \rangle \Downarrow_e i} \text{CONST, when } i \text{ is a integer.}$$

$$\frac{}{\langle u, \sigma \rangle \Downarrow_e v} \text{VAR, if } u := v \in \sigma.$$

$$\frac{\langle e_1, \sigma \rangle \Downarrow_e v_1 \quad \langle e_2, \sigma \rangle \Downarrow_e v_2}{\langle e_1 \oplus e_2, \sigma \rangle \Downarrow_e v_1 \oplus v_2} \text{ARITH}$$

Boolean Rules

$$\frac{}{\langle i, \sigma \rangle \Downarrow_b b} \text{CONST, when } b \text{ is true or false.}$$

$$\frac{}{\langle u, \sigma \rangle \Downarrow_b v} \text{VAR, if } u := v \in \sigma.$$

$$\frac{\langle e_1, \sigma \rangle \Downarrow_e v_1 \quad \langle e_2, \sigma \rangle \Downarrow_e v_2}{\langle e_1 \sim e_2, \sigma \rangle \Downarrow_b v_1 \sim v_2} \text{REL}$$

Statement Rules

$$\frac{}{\langle \text{skip}, \sigma \rangle \Downarrow \sigma} \text{SKIP}$$

$$\frac{\langle e, \sigma \rangle \Downarrow_e v}{\langle x := e, \sigma \rangle \Downarrow \sigma[x := v]} \text{ASSIGN}$$

$$\frac{\langle S_1, \sigma \rangle \Downarrow \sigma' \quad \langle S_2, \sigma' \rangle \Downarrow \sigma''}{\langle S_1; S_2, \sigma \rangle \Downarrow \sigma''} \text{SEQ}$$

$$\frac{\langle B, \sigma \rangle \Downarrow_b \text{true} \quad \langle S_1, \sigma \rangle \Downarrow \sigma'}{\langle \text{if } B \text{ then } S_1 \text{ else } S_2 \text{ fi}, \sigma \rangle \Downarrow \sigma'} \text{IF}_1$$

$$\frac{\langle B, \sigma \rangle \Downarrow_b \text{false} \quad \langle S_2, \sigma \rangle \Downarrow \sigma'}{\langle \text{if } B \text{ then } S_1 \text{ else } S_2 \text{ fi}, \sigma \rangle \Downarrow \sigma'} \text{IF}_2$$

$$\frac{\langle B, \sigma \rangle \Downarrow_b \text{false}}{\langle \text{while } B \text{ do } S \text{ od}, \sigma \rangle \Downarrow \sigma} \text{WHILE}_1$$

$$\frac{\langle B, \sigma \rangle \Downarrow_b \text{true} \quad \langle S, \sigma \rangle \Downarrow \sigma' \quad \langle \text{while } B \text{ do } S \text{ od}, \sigma' \rangle \Downarrow \sigma''}{\langle \text{while } B \text{ do } S \text{ od}, \sigma \rangle \Downarrow \sigma''} \text{WHILE}_2$$