CS 421 --- Big Step Semantics Rules

Expression Rules

$$\frac{}{< i, \sigma >\Downarrow_e i}\ \textsc{Const}, \text{ when } i \text{ is a integer.}$$

$$\frac{}{< u, \sigma >\Downarrow_e v}\ \textsc{Var}, \text{ if } u := v \in \sigma.$$

$$\frac{< e_1, \sigma >\Downarrow_e v_1 \qquad < e_2, \sigma >\Downarrow_e v_2}{< e_1 \oplus e_2, \sigma >\Downarrow_e v_1 \oplus v_2}\ \textsc{Arith}$$

Boolean Rules

$$\frac{}{< i, \sigma >\Downarrow_b b}\ \textsc{Const}, \text{ when } b \text{ is } \texttt{true} \text{ or } \texttt{false}.$$

$$\frac{}{< u, \sigma >\Downarrow_b v}\ \textsc{Var}, \text{ if } u := v \in \sigma.$$

$$\frac{< e_1, \sigma >\Downarrow_e v_1 \qquad < e_2, \sigma >\Downarrow_e v_2}{< e_1 \sim e_2, \sigma >\Downarrow_b v_1 \sim v_2}\ \textsc{Comp}$$

Statement Rules

$$\frac{}{< \texttt{skip}, \sigma >\Downarrow \sigma}\ \textsc{Skip} \qquad \frac{< e, \sigma >\Downarrow_e v}{< x := e, \sigma >\Downarrow \sigma[x := v]}\ \textsc{Assign}$$

$$\frac{< S_1, \sigma >\Downarrow \sigma' \qquad < S_2, \sigma' >\Downarrow \sigma''}{< S_1; S_2, \sigma >\Downarrow \sigma''}\ \textsc{Seq}$$

$$\frac{< B, \sigma >\Downarrow_b \texttt{true} \qquad < S_1, \sigma >\Downarrow \sigma'}{< \texttt{if } B \texttt{ then } S_1 \texttt{ else } S_2 \texttt{ fi}, \sigma >\Downarrow \sigma'}\ \textsc{If}_1 \qquad \frac{< B, \sigma >\Downarrow_b \texttt{false} \qquad < S_2, \sigma >\Downarrow \sigma'}{< \texttt{if } B \texttt{ then } S_1 \texttt{ else } S_2 \texttt{ fi}, \sigma >\Downarrow \sigma'}\ \textsc{If}_2$$

$$\frac{< B, \sigma >\Downarrow_b \texttt{false}}{< \texttt{while } B \texttt{ do } S \texttt{ od}, \sigma >\Downarrow \sigma}\ \textsc{While}_1$$

$$\frac{< B, \sigma >\Downarrow_b \texttt{true} \qquad < S, \sigma >\Downarrow \sigma' \qquad < \texttt{while } B \texttt{ do } S \texttt{ od}, \sigma' >\Downarrow \sigma''}{< \texttt{while } B \texttt{ do } S \texttt{ od}, \sigma >\Downarrow \sigma''}\ \textsc{While}_2$$