Semantyka dużych kroków

Konfiguracja początkowa: $\texttt{BExpr} \times \texttt{Instr} \times \texttt{State}$
Konfiguracja końcowa: $\texttt{State} \cup (\texttt{State} \times \{\texttt{brk}, \texttt{esc}\})$

$e \in \texttt{Expr}$
$b, cond \in \texttt{BExpr}$
$s, s', s'' \in \texttt{State}$
$\texttt{end} \in \{\texttt{brk}, \texttt{esp}\}$
$S, S_1, S_2 \in \texttt{Instr}$
$[\![\textbf{true}]\!] = tt$
$[\![\textbf{false}]\!] = ff$

$cond = \texttt{false}$ dla wyrażeń poza pętlą

$$\frac{}{cond \vdash \textbf{skip}, s \longrightarrow s}$$

$$\frac{[\![e]\!]s = n}{cond \vdash x := e, s \longrightarrow s[x \to n]}$$

$$\frac{cond \vdash S_1, s \longrightarrow s' \quad cond \vdash S_2, s' \longrightarrow s''}{cond \vdash S_1; S_2, s \longrightarrow s''}$$

$$\frac{cond \vdash S_1, s \longrightarrow s', \texttt{end}}{cond \vdash S_1; S_2, s \longrightarrow s', \texttt{end}}$$

$$\frac{cond \vdash S_1, s \longrightarrow s' \quad cond \vdash S_2, s' \longrightarrow s'', \texttt{end}}{cond \vdash S_1; S_2, s \longrightarrow s'', \texttt{end}}$$

$$\frac{[\![b]\!]s = tt \quad cond \vdash S_1, s \longrightarrow s'}{cond \vdash \textbf{if } b \textbf{ then } S_1 \textbf{ else } S_2, s \longrightarrow s'}$$

$$\frac{[\![b]\!]s = ff \quad cond \vdash S_2, s \longrightarrow s'}{cond \vdash \textbf{if } b \textbf{ then } S_1 \textbf{ else } S_2, s \longrightarrow s'}$$

$$\frac{[\![b]\!]s = tt \quad cond \vdash S_1, s \longrightarrow s', \texttt{end}}{cond \vdash \textbf{if } b \textbf{ then } S_1 \textbf{ else } S_2, s \longrightarrow s', \texttt{end}}$$

$$\frac{[\![b]\!]s = ff \quad cond \vdash S_2, s \longrightarrow s', \texttt{end}}{cond \vdash \textbf{if } b \textbf{ then } S_1 \textbf{ else } S_2, s \longrightarrow s', \texttt{end}}$$

$$\frac{b \vdash S, s \longrightarrow s' \quad cond \vdash \textbf{repeat } S \textbf{ until } b, s' \longrightarrow s''}{cond \vdash \textbf{repeat } S \textbf{ until } b, s \longrightarrow s''}$$

$$\frac{b \vdash S, s \longrightarrow s' \quad cond \vdash \textbf{repeat } S \textbf{ until } b, s' \longrightarrow s'', \texttt{esc}}{cond \vdash \textbf{repeat } S \textbf{ until } b, s \longrightarrow s'', \texttt{esc}}$$

$$\frac{b \vdash S, s \longrightarrow s', \texttt{brk}}{cond \vdash \textbf{repeat } S \textbf{ until } b, s \longrightarrow s'}$$

$$\frac{b \vdash S, s \longrightarrow s', \texttt{esc}}{cond \vdash \textbf{repeat } S \textbf{ until } b, s \longrightarrow s', \texttt{esc}}$$

$$\frac{}{cond \vdash \textbf{break}, s \longrightarrow s, \texttt{brk}}$$

$$\frac{}{cond \vdash \textbf{escape}, s \longrightarrow s, \texttt{esc}}$$

Semantyka małych kroków

Konfiguracja: $(\texttt{BExpr} \times \texttt{Instr} \times \texttt{State}) \cup (\texttt{State} \times \{\texttt{brk}, \texttt{esc}\}) \cup \texttt{State}$
Rozszerzamy składnię `Instr` poleceniami niedostępnymi dla programisty:
$\texttt{Instr} ::= \ldots \mid \textbf{loop}\ S_1\ \textbf{with}\ S_2\ \textbf{until}\ b \mid \textbf{break!} \mid \textbf{escape!}$

$e \in \texttt{Expr}$
$b, cond \in \texttt{BExpr}$
$s, s' \in \texttt{State}$
$\texttt{end} \in \{\texttt{brk}, \texttt{esp}\}$
$S, S_1, S_2, S_1', S_2' \in \texttt{Instr}$
$[\![\textbf{true}]\!] = tt$
$[\![\textbf{false}]\!] = ff$

$cond = \texttt{false}$ dla wyrażeń poza pętlą

$$\frac{}{cond \vdash \textbf{skip}, s \Rightarrow s}$$

$$\frac{[\![e]\!]s = n}{cond \vdash x := e, s \Rightarrow s[x \to n]}$$

$$\frac{cond \vdash S_1, s \Rightarrow s'}{cond \vdash S_1; S_2, s \Rightarrow S_2, s'}$$

$$\frac{cond \vdash S_1, s \Rightarrow S_1', s'}{cond \vdash S_1; S_2, s \Rightarrow S_1'; S_2, s'}$$

$$\frac{cond \vdash S_1, s \Rightarrow s', \texttt{end}}{cond \vdash S_1; S_2, s \Rightarrow s', \texttt{end}}$$

$$\frac{[\![b]\!]s = tt}{cond \vdash \textbf{if}\ b\ \textbf{then}\ S_1\ \textbf{else}\ S_2, s \Rightarrow S_1, s}$$

$$\frac{[\![b]\!]s = ff}{cond \vdash \textbf{if}\ b\ \textbf{then}\ S_1\ \textbf{else}\ S_2, s \Rightarrow S_2, s}$$

$$\frac{}{cond \vdash \textbf{repeat}\ S\ \textbf{until}\ b, s \Rightarrow \textbf{loop}\ S\ \textbf{with}\ S\ \textbf{until}\ b, s}$$

$$\frac{b \vdash S_1, s \Rightarrow S_1', s'}{cond \vdash \textbf{loop}\ S_1\ \textbf{with}\ S_2\ \textbf{until}\ b, s \Rightarrow \textbf{loop}\ S_1'\ \textbf{with}\ S_2\ \textbf{until}\ b, s'}$$

$$\frac{b \vdash S_1, s \Rightarrow s'}{cond \vdash \textbf{loop}\ S_1\ \textbf{with}\ S_2\ \textbf{until}\ b, s \Rightarrow \textbf{loop}\ S_2\ \textbf{with}\ S_2\ \textbf{until}\ b, s'}$$

$$\frac{b \vdash S_1, s \Rightarrow s', \texttt{brk}}{cond \vdash \textbf{loop}\ S_1\ \textbf{with}\ S_2\ \textbf{until}\ b, s \Rightarrow s'}$$

$$\frac{b \vdash S_1, s \Rightarrow s', \texttt{esc}}{cond \vdash \textbf{loop}\ S_1\ \textbf{with}\ S_2\ \textbf{until}\ b, s \Rightarrow s', \texttt{esc}}$$

$$\frac{}{cond \vdash \textbf{break}, s \Rightarrow \textbf{if}\ cond\ \textbf{then break! else skip}}$$

$$\frac{}{cond \vdash \textbf{escape}, s \Rightarrow \textbf{if}\ cond\ \textbf{then escape! else skip}}$$

$$\frac{}{cond \vdash \textbf{break!}, s \Rightarrow s, \texttt{brk}}$$

$$\frac{}{cond \vdash \textbf{escape!}, s \Rightarrow s, \texttt{esc}}$$