Models of Computation Assessed Coursework I

A. Student

November 6, 2014

This document is a skeleton which provides macros to help typeset your solution to the coursework.

Rules can be typeset like this:

$$\textsc{e.var}\ \frac{x \in \mathrm{dom}(s)}{\langle x, s, h\rangle \Downarrow_e \langle s(x), s, h\rangle} \qquad \textsc{e.num}\ \frac{}{\langle n, s, h\rangle \Downarrow_e \langle n, s, h\rangle}$$

$$\textsc{e.add}\ \frac{\langle E_1, s, h\rangle \Downarrow_e \langle n_1, s', h'\rangle \qquad \langle E_2, s', h'\rangle \Downarrow_e \langle n_2, s'', h''\rangle \qquad n_3 = n_1 \pm n_2}{\langle E_1 + E_2, s, h\rangle \Downarrow_e \langle n_3, s'', h''\rangle}$$

$$\textsc{e.new}\ \frac{a \notin \mathrm{dom}(h) \qquad (a+1) \notin \mathrm{dom}(h)}{\langle \texttt{newpair}, s, h\rangle \Downarrow_e \langle \ulcorner a \urcorner, s, h[a \mapsto 0][a+1 \mapsto 0]\rangle}$$

$$\textsc{e.fst}\ \frac{\langle E, s, h\rangle \Downarrow_e \langle \ulcorner a \urcorner, s', h'\rangle \qquad a \in \mathrm{dom}(h')}{\langle E.\texttt{fst}, s, h\rangle \Downarrow_e \langle h'(a), s', h'\rangle}$$

$$\textsc{e.snd}\ \frac{\langle E, s, h\rangle \Downarrow_e \langle \ulcorner a \urcorner, s', h'\rangle \qquad a+1 \in \mathrm{dom}(h')}{\langle E.\texttt{snd}, s, h\rangle \Downarrow_e \langle h'(a+1), s', h'\rangle}$$

Derivations can be typeset as in Figure 1

Types:

$$\Gamma; s; h \vdash \mathsf{well\text{-}typed}$$
$$\Gamma \vdash E : \tau$$
$$h \Vdash v : \tau$$

Suppose that $\Gamma; s; h \vdash \mathsf{well\text{-}typed}$. We wish to show that

$$\Gamma \vdash E : \tau \implies h \Vdash v : \tau.$$

$$
(\dagger) \equiv
\dfrac{
\dfrac{
\dfrac{
\dfrac{\neg(p \vee \neg p), p \vdash p}{\neg(p \vee \neg p), p \vdash p}\,\vee\text{I-L}
\qquad
\dfrac{}{\neg(p \vee \neg p) \vdash \neg(p \vee \neg p)}\,\text{Ax}
}{\neg(p \vee \neg p), p \vdash \bot}\,\neg\text{E}
}{\neg(p \vee \neg p) \vdash \neg p}\,\neg\text{I}
}{\neg(p \vee \neg p) \vdash p \vee \neg p}\,\vee\text{I-R}
$$

$$
\dfrac{
\dfrac{
\dfrac{
(\dagger)
\qquad
\dfrac{}{\neg(p \vee \neg p) \vdash \neg(p \vee \neg p)}\,\text{Ax}
}{\neg(p \vee \neg p) \vdash \bot}\,\neg\text{E}
}{\vdash \neg\neg(p \vee \neg p)}\,\neg\text{I}
}{\vdash p \vee \neg p}\,\neg\neg\text{E}
$$

Figure 1: A derivation