Funcons-beta: Controlling

The PLanCompS Project

`Funcons-beta/Computations/Abnormal/Controlling/Controlling.cbs`*

Controlling

[*Datatype* continuations
  Funcon continuation
  Entity plug-signal
  Funcon hole
  Funcon resume-continuation
  Entity control-signal
  Funcon control
  Funcon delimit-current-continuation
  Alias delimit-cc]

Meta-variables $T, T_1, T_2 <:$ values

Datatype continuations(T_1, T_2) ::= continuation$(_ :$ abstractions$(( ) \Rightarrow T_2))$

continuations(T_1, T_2) consists of abstractions whose bodies contain a hole, and which will normally compute a value of type T_2 when the hole is plugged with a value of type T_1.

Entity $\_ \xrightarrow{\text{plug-signal}(V^? : \text{values}^?)} \_$

A plug-signal contains the value to be filled into a hole in a continuation, thereby allowing a continuation to resume.

Funcon hole $: \Rightarrow$ values

*Suggestions for improvement: `plancomps@gmail.com`.
Issues: `https://github.com/plancomps/CBS-beta/issues`.

A hole in a term cannot proceed until it receives a plug-signal containing a value to plug the hole.

Rule $\mathsf{hole} \xrightarrow{\mathsf{plug\text{-}signal}(V)} V$

Funcon $\mathsf{resume\text{-}continuation}(K : \mathsf{continuations}(T_1, T_2), V : T_1) : \Rightarrow T_2$

$\mathsf{resume\text{-}continuation}(K, V)$ resumes a continuation K by plugging the value V into the hole in the continuation.

$$\textit{Rule}\ \frac{X \xrightarrow{\mathsf{plug\text{-}signal}(V)} X'}{\mathsf{resume\text{-}continuation}(\mathsf{continuation}(\mathsf{abstraction}(X)), V : T) \xrightarrow{\mathsf{plug\text{-}signal}(\ )} X'}$$

Entity $\_ \xrightarrow{\mathsf{control\text{-}signal}(F^? : (\mathsf{functions}(\mathsf{continuations}(T_1, T_2), T_2))^?)} \_$

A control-signal contains the function to which control is about to be passed by the enclosing $\mathsf{delimit\text{-}current\text{-}continuation}(X)$.

Funcon $\mathsf{control}(F : \mathsf{functions}(\mathsf{continuations}(T_1, T_2), T_2)) : \Rightarrow T_1$

$\mathsf{control}(F)$ emits a control-signal that, when handled by an enclosing $\mathsf{delimit\text{-}current\text{-}continuation}(X)$, will apply F to the current continuation of $\mathsf{control}(F)$, (rather than proceeding with that current continuation).

Rule $\mathsf{control}(F : \mathsf{functions}(\_, \_)) \xrightarrow{\mathsf{control\text{-}signal}(F)} \mathsf{hole}$

Funcon $\mathsf{delimit\text{-}current\text{-}continuation}(X : \Rightarrow T) : \Rightarrow T$

Alias $\mathsf{delimit\text{-}cc} = \mathsf{delimit\text{-}current\text{-}continuation}$

$\mathsf{delimit\text{-}current\text{-}continuation}(X)$ delimits the scope of captured continuations.

Rule $\mathsf{delimit\text{-}current\text{-}continuation}(V : T) \rightsquigarrow V$

$$\textit{Rule}\ \frac{X \xrightarrow{\mathsf{control\text{-}signal}(\ )} X'}{\mathsf{delimit\text{-}current\text{-}continuation}(X) \xrightarrow{\mathsf{control\text{-}signal}(\ )} \mathsf{delimit\text{-}current\text{-}continuation}(X')}$$

$$\textit{Rule}\ \frac{X \xrightarrow{\mathsf{control\text{-}signal}(F)} X'}{\mathsf{delimit\text{-}current\text{-}continuation}(X) \xrightarrow{\mathsf{control\text{-}signal}(\ )} \mathsf{delimit\text{-}current\text{-}continuation}(\mathsf{apply}(F, \mathsf{continuation}$$