

TODO: Mark partial functions as such (with \rightarrow)

7 The language

Having put into place all the necessary definitions, we can now specify the actual Programming language:

7.1 Type names

$\langle type \rangle \quad ::= \text{TODO: Specify this!}$

TODO: Add static rules to assign these phrases the type they refer to!

7.2 Expressions

The following grammar specifies how expressions are to be formed:

$\langle exp \rangle$	$::= \langle eq-check \rangle [\textcolor{blue}{?} \langle exp \rangle : \langle exp \rangle]$
$\langle eq-check \rangle$	$::= \langle ty-check \rangle [(= \neq) \langle exp \rangle]$
$\langle ty-check \rangle$	$::= \langle call \rangle [(\in \notin) \langle type \rangle]$
$\langle call \rangle$	$::= \langle projection \rangle \langle call' \rangle \textcolor{blue}{new} \langle id \rangle \langle call' \rangle$
$\langle call' \rangle$	$::= [\langle projection \rangle \langle call' \rangle]$
$\langle projection \rangle$	$::= \langle primitive \rangle \langle projection' \rangle$
$\langle projection' \rangle$	$::= [\textcolor{blue}{[} \langle exp \rangle [\textcolor{blue}{:} \langle exp \rangle] \textcolor{blue}{]} \langle projection' \rangle]$
$\langle primitive \rangle$	$::= \langle bits \rangle \langle symbols \rangle \langle id \rangle \textcolor{blue}{\lambda} \langle parameters \rangle \langle block \rangle \textcolor{blue}{(} \langle exp \rangle \textcolor{blue}{)},$
$\langle parameter \rangle$	$::= \langle type \rangle \langle id \rangle$
$\langle parameters \rangle$	$::= [\langle parameter \rangle \langle parameters \rangle]$

Given a **type context** $T : \mathbb{S} \rightarrow Types$, the **static semantics** of these expressions are defined by the following inference rules:

$$\frac{l(i) = \langle bits \rangle}{T \vdash i \triangleright bit} \quad \frac{l(i) = \langle symbols \rangle}{T \vdash i \triangleright symbol} \quad \frac{l(i) = \langle id \rangle \quad i \rightarrow j \quad T \vdash l(j) \triangleright t}{T \vdash i \triangleright t}$$

$$\frac{l(i) = \langle parameter \rangle \quad T \vdash i[0] \triangleright t}{T \vdash i \triangleright t} \quad \frac{l(i) = \langle parameters \rangle \quad T \vdash i[0] \triangleright t \quad T \vdash i[1] \triangleright t'}{T \vdash i \triangleright t \rightarrow t'}$$

For $i \in \mathbb{S}$ with $l(i) \in \{\langle parameter \rangle, \langle parameters \rangle\}$ and a type context T we define $e(T) : \mathbb{S} \rightarrow (\mathbb{S} \rightarrow \wp(Types))$ by

$$\frac{l(i) = \langle parameter \rangle \quad T \vdash i[0] \triangleright t \quad lw(i[1]) = p}{e(T)(i) = T[p := t]}$$

TODO: Guess we should make sure that there aren't two equally named parameters! (Cause that's nonsense.)

$$\frac{l(i) = \langle parameters \rangle \quad e \vdash (\triangleright T)(i[0]) = T' \quad e(T')(i[1]) = T''}{e(T)(i) = T''}$$

$$\frac{l(i) = \langle abs \rangle}{T \vdash i \triangleright t \rightarrow t'}$$

TODO: We need to assign parameters their types!

$$\frac{l(i) = \langle abs \rangle \quad T \vdash i[0] \triangleright t \quad T[] \vdash i[1] \triangleright t'}{T \vdash i \triangleright t \rightarrow t'}$$

7.3 Statements

$$t(S, \rightarrow_2, s_0) := (S, \{s \xrightarrow{A}_1 s' \mid A \neq \emptyset \wedge (\forall \alpha \in A : s \xrightarrow{\alpha}_2 s')\}, s_0)$$

$\langle block \rangle ::= \text{TODO: Specify this!}$

TODO: Add an index that is to contain at least all defined terms!