

LAMBDA

MODULE LAMBDA

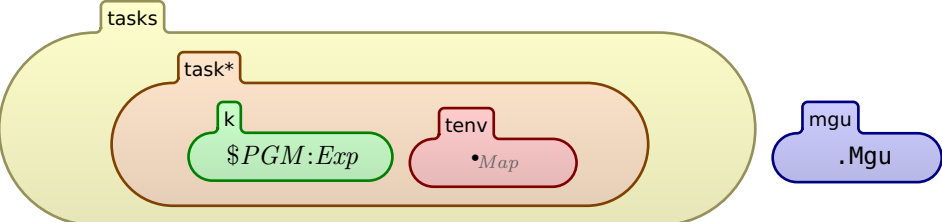
SYNTAX $Exp ::= Int$
| $Bool$
| Id
| (Exp) [bracket]
| $Exp \text{ } Exp$
| $Exp * Exp$
| Exp / Exp
| $Exp + Exp$
| $Exp \leq Exp$
| $lambda \text{ } Id . Exp$
| $if \text{ } Exp \text{ then } Exp \text{ else } Exp$
| $let \text{ } Id = Exp \text{ in } Exp$
| $letrec \text{ } Id \text{ } Id = Exp \text{ in } Exp$
| $mu \text{ } Id . Exp$

SYNTAX $Type ::= int$
| $bool$
| $Type \rightarrow Type$
| $(Type)$ [bracket]

SYNTAX $Exp ::= Type$

SYNTAX $KResult ::= Type$

CONFIGURATION:



RULE $\frac{I:Int}{int}$

RULE $\frac{B:Bool}{bool}$

RULE $\frac{\begin{array}{c} k \\ X, Id \\ T \end{array}}{\begin{array}{c} tenv \\ X \mapsto T \end{array}}$

RULE $\frac{\begin{array}{c} k \\ E1 * E2 \\ int \end{array}}{\begin{array}{c} tenv \\ \rho \end{array}} \rightarrow \left(\begin{array}{c} \text{task} \\ \begin{array}{c} k \\ E1 = int \\ \rho \end{array} \\ \text{task} \\ \begin{array}{c} k \\ E2 = int \\ \rho \end{array} \end{array} \right)$

RULE $\frac{\begin{array}{c} k \\ E1 / E2 \\ int \end{array}}{\begin{array}{c} tenv \\ \rho \end{array}} \rightarrow \left(\begin{array}{c} \text{task} \\ \begin{array}{c} k \\ E1 = int \\ \rho \end{array} \\ \text{task} \\ \begin{array}{c} k \\ E2 = int \\ \rho \end{array} \end{array} \right)$

RULE $\frac{\begin{array}{c} k \\ E1 + E2 \\ int \end{array}}{\begin{array}{c} tenv \\ \rho \end{array}} \rightarrow \left(\begin{array}{c} \text{task} \\ \begin{array}{c} k \\ E1 = int \\ \rho \end{array} \\ \text{task} \\ \begin{array}{c} k \\ E2 = int \\ \rho \end{array} \end{array} \right)$

RULE $\frac{\begin{array}{c} k \\ E1 \leq E2 \\ bool \end{array}}{\begin{array}{c} tenv \\ \rho \end{array}} \rightarrow \left(\begin{array}{c} \text{task} \\ \begin{array}{c} k \\ E1 = int \\ \rho \end{array} \\ \text{task} \\ \begin{array}{c} k \\ E2 = int \\ \rho \end{array} \end{array} \right)$

RULE $\frac{\begin{array}{c} k \\ lambda \text{ } X . E \\ Tx \rightarrow Te \end{array}}{\begin{array}{c} tenv \\ TEnv \end{array}} \rightarrow \left(\begin{array}{c} \text{task} \\ \begin{array}{c} k \\ E = Te \\ TEnv[Tx / X] \end{array} \end{array} \right)$ requires $fresh(Tx:Type) \wedge_{Bool} fresh(Te:Type)$

RULE $\frac{\begin{array}{c} k \\ E1 \text{ } E2 \\ T \end{array}}{\begin{array}{c} tenv \\ \rho \end{array}} \rightarrow \left(\begin{array}{c} \text{task} \\ \begin{array}{c} k \\ E1 = T2 \rightarrow T \\ \rho \end{array} \\ \text{task} \\ \begin{array}{c} k \\ E2 = T2 \\ \rho \end{array} \end{array} \right)$ requires $fresh(T2:Type) \wedge_{Bool} fresh(T:Type)$

RULE $\frac{\begin{array}{c} k \\ if \text{ } E \text{ then } E1 \text{ else } E2 \\ T \end{array}}{\begin{array}{c} tenv \\ \rho \end{array}} \rightarrow \left(\begin{array}{c} \text{task} \\ \begin{array}{c} k \\ E = bool \\ \rho \end{array} \\ \text{task} \\ \begin{array}{c} k \\ E1 = T \\ \rho \end{array} \\ \text{task} \\ \begin{array}{c} k \\ E2 = T \\ \rho \end{array} \end{array} \right)$ requires $fresh(T:Type)$

RULE $\frac{let \text{ } X = E \text{ in } E'}{(lambda \text{ } X . E') E}$ [macro]

RULE $\frac{letrec \text{ } F \text{ } X = E \text{ in } E'}{let \text{ } F = mu \text{ } F . lambda \text{ } X . E \text{ in } E'}$ [macro]

RULE $\frac{\begin{array}{c} k \\ mu \text{ } X . E \\ T \end{array}}{\begin{array}{c} tenv \\ TEnv \end{array}} \rightarrow \left(\begin{array}{c} \text{task} \\ \begin{array}{c} k \\ E = T \\ TEnv[T / X] \end{array} \end{array} \right)$ requires $fresh(T:Type)$

SYNTAX $K ::= Exp = Exp$ [strict]

RULE $\frac{\begin{array}{c} k \\ T:Type = T':Type \\ \bullet_K \end{array}}{\begin{array}{c} mgu \\ \theta:Mgu \\ updateMgu(\theta, T, T') \end{array}}$

RULE $\frac{\begin{array}{c} \text{tasks} \\ \text{task} \\ \begin{array}{c} k \\ T:Type \\ \theta(T) \end{array} \end{array}}{\begin{array}{c} mgu \\ \theta:Mgu \\ \bullet_K \end{array}}$

RULE $\frac{\begin{array}{c} \text{task} \\ \begin{array}{c} k \\ \bullet_K \end{array} \end{array}}{\bullet_{Bag}}$

END MODULE