$termvar,\ x,\ y,\ z,\ f$
$typevar,\ X,\ Y,\ Z$
$index,\ i,\ j,\ k$

$t,\ c,\ s$	::=		
	|	x	
	|	triv	
	|	box	
	|	unbox	
	|	error	
	|	$\Lambda(X <: A).t$	
	|	$[A]t$	
	|	$\lambda(x : A).t$	
	|	$t_1\ t_2$	
	|	(t_1, t_2)	
	|	fst t	
	|	snd t	
	|	succ t	
	|	0	
	|	case t of $t_3 \to t_1, t_4 \to t_2$	
	|	$[]$	
	|	$t :: t'$	
	|	(t)	S
	|	squash	
	|	split	
$n,\ m$	::=		
	|	0	
	|	succ n	
v	::=		
	|	triv	
	|	$[]$	
	|	squash_S	
	|	split_S	
	|	box_A	
	|	unbox_A	
	|	$\Lambda(X <: A).t$	
	|	$\lambda(x : A).t$	
	|	n	
Knd	::=		
	|	$\star$	
$A,\ B,\ C,\ D,\ E,\ S,\ U,\ K$	::=		
	|	X	
	|	$\top$	
	|	List A	
	|	$\forall(X <: A).B$	
	|	$\mathbb{S}$	
	|	Unit	

$$
\begin{array}{lll}
 & | & \mathsf{Nat} \\
 & | & ? \\
 & | & A_1 \to A_2 \\
 & | & A_1 \times A_2 \\
 & | & (A) \qquad\qquad \mathsf{S}
\end{array}
$$

$$
\begin{array}{lll}
\Gamma & ::= & \\
 & | & \cdot \\
 & | & \Gamma, X <: A \\
 & | & \Gamma, x : A
\end{array}
$$

$\boxed{\Gamma \vdash A : \star}$

$$\frac{\Gamma_1 \vdash A : \star}{\Gamma_1, X <: A, \Gamma_2 \vdash X : \star} \quad \text{K\_VAR}$$

$$\frac{}{\Gamma \vdash \mathsf{Unit} : \star} \quad \text{K\_UNIT}$$

$$\frac{}{\Gamma \vdash \mathsf{Nat} : \star} \quad \text{K\_NAT}$$

$$\frac{}{\Gamma \vdash ? : \star} \quad \text{K\_UNITYPE}$$

$$\frac{\Gamma \vdash A : \star}{\Gamma \vdash \mathsf{List}\ A : \star} \quad \text{K\_LIST}$$

$$\frac{\Gamma \vdash A : \star \quad \Gamma \vdash B : \star}{\Gamma \vdash A \to B : \star} \quad \text{K\_ARROW}$$

$$\frac{\Gamma \vdash A : \star \quad \Gamma \vdash B : \star}{\Gamma \vdash A \times B : \star} \quad \text{K\_PROD}$$

$$\frac{\Gamma, X <: A \vdash B : \star}{\Gamma \vdash \forall (X <: A).B : \star} \quad \text{K\_FORALL}$$

$\boxed{\Gamma\ \mathrm{Ok}}$

$$\frac{}{\cdot\ \mathrm{Ok}} \quad \text{OK\_EMPTY}$$

$$\frac{\Gamma\ \mathrm{Ok} \quad \Gamma \vdash A : \star}{(\Gamma, X <: A)\ \mathrm{Ok}} \quad \text{OK\_TYPEVAR}$$

$$\frac{\Gamma\ \mathrm{Ok} \quad \Gamma \vdash A : \star}{(\Gamma, x : A)\ \mathrm{Ok}} \quad \text{OK\_VAR}$$

$\boxed{\Gamma \vdash A <: B}$

$$\frac{\Gamma \vdash A : \star}{\Gamma \vdash A <: A} \quad \text{S\_REFL}$$

$$\frac{\Gamma \vdash A : \star}{\Gamma \vdash A <: \top} \quad \text{S\_U}$$

$$\frac{X <: A \in \Gamma \quad \Gamma\ \mathrm{Ok}}{\Gamma \vdash X <: A} \quad \text{S\_VAR}$$

$$\frac{\Gamma \vdash A <: B}{\Gamma \vdash \mathsf{List}\ A <: \mathsf{List}\ B} \quad \text{S\_LIST}$$

$$\frac{\Gamma \vdash A_1 <: A_2 \quad \Gamma \vdash B_1 <: B_2}{\Gamma \vdash A_1 \times B_1 <: A_2 \times B_2} \text{ S\_Prod}$$

$$\frac{\Gamma \vdash A_2 <: A_1 \quad \Gamma \vdash B_1 <: B_2}{\Gamma \vdash A_1 \to B_1 <: A_2 \to B_2} \text{ S\_Arrow}$$

$$\frac{\Gamma, X <: A \vdash B_1 <: B_2}{\Gamma \vdash \forall(X <: A).B_1 <: \forall(X <: A).B_2} \text{ S\_Forall}$$

$\boxed{\Gamma \vdash t : A}$

$$\frac{x : A \in \Gamma \quad \Gamma \text{ Ok}}{\Gamma \vdash x : A} \text{ T\_varP}$$

$$\frac{\Gamma \text{ Ok}}{\Gamma \vdash \mathsf{box} : \forall(X <: \mathbb{S}).(X \to ?)} \text{ T\_Box}$$

$$\frac{\Gamma \text{ Ok}}{\Gamma \vdash \mathsf{unbox} : \forall(X <: \mathbb{S}).(? \to X)} \text{ T\_Unbox}$$

$$\frac{\Gamma \text{ Ok}}{\Gamma \vdash \mathsf{squash} : K \to ?} \text{ T\_squash}$$

$$\frac{\Gamma \text{ Ok}}{\Gamma \vdash \mathsf{split} : ? \to K} \text{ T\_split}$$

$$\frac{\Gamma \text{ Ok}}{\Gamma \vdash \mathsf{triv} : \mathsf{Unit}} \text{ T\_unitP}$$

$$\frac{\Gamma \text{ Ok}}{\Gamma \vdash 0 : \mathsf{Nat}} \text{ T\_zeroP}$$

$$\frac{\Gamma \vdash t : \mathsf{Nat}}{\Gamma \vdash \mathsf{succ}\, t : \mathsf{Nat}} \text{ T\_succ}$$

$$\frac{\begin{array}{l}\Gamma \vdash t : \mathsf{Nat} \\ \Gamma \vdash t_1 : A \quad \Gamma, x : \mathsf{Nat} \vdash t_2 : A\end{array}}{\Gamma \vdash \mathsf{case}\, t\, \mathsf{of}\, 0 \to t_1, (\mathsf{succ}\, x) \to t_2 : A} \text{ T\_nCase}$$

$$\frac{\Gamma \text{ Ok} \quad \Gamma \vdash A : \star}{\Gamma \vdash [] : \forall(X <: ?).\mathsf{List}\, X} \text{ T\_empty}$$

$$\frac{\Gamma \vdash t_1 : A \quad \Gamma \vdash t_2 : \mathsf{List}\, A}{\Gamma \vdash t_1 :: t_2 : \mathsf{List}\, A} \text{ T\_cons}$$

$$\frac{\begin{array}{l}\Gamma \vdash t : \mathsf{List}\, A \\ \Gamma \vdash t_1 : B \quad \Gamma, x : A, y : \mathsf{List}\, A \vdash t_2 : B\end{array}}{\Gamma \vdash \mathsf{case}\, t\, \mathsf{of}\, [] \to t_1, (x :: y) \to t_2 : B} \text{ T\_lCase}$$

$$\frac{\Gamma \vdash t_1 : A_1 \quad \Gamma \vdash t_2 : A_2}{\Gamma \vdash (t_1, t_2) : A_1 \times A_2} \text{ T\_pair}$$

$$\frac{\Gamma \vdash t : A_1 \times A_2}{\Gamma \vdash \mathsf{fst}\, t : A_1} \text{ T\_fst}$$

$$\frac{\Gamma \vdash t : A_1 \times A_2}{\Gamma \vdash \mathsf{snd}\, t : A_2} \text{ T\_snd}$$

$$\frac{\Gamma, x : A \vdash t : B}{\Gamma \vdash \lambda(x : A).t : A \to B} \text{ T\_lam}$$

$$\frac{\Gamma \vdash t_1 : A \to B \quad \Gamma \vdash t_2 : A}{\Gamma \vdash t_1\ t_2 : B}\ \text{T\_APP}$$

$$\frac{\Gamma, X <: A \vdash t : B}{\Gamma \vdash \Lambda(X <: A).t : \forall(X <: A).B}\ \text{T\_LAM}$$

$$\frac{\Gamma \vdash t : \forall(X <: B).C \quad \Gamma \vdash A <: B}{\Gamma \vdash [A]t : [A/X]C}\ \text{T\_TYPEAPP}$$

$$\frac{\Gamma \vdash t : A \quad \Gamma \vdash A <: B}{\Gamma \vdash t : B}\ \text{T\_SUB}$$

$$\frac{}{\Gamma \vdash \mathsf{error} : A}\ \text{T\_ERROR}$$

$\boxed{t_1 \rightsquigarrow t_2}$ call by name

$$\frac{}{\mathsf{unbox}_A\,(\mathsf{box}_A\,t) \rightsquigarrow t}\ \text{RD\_RETRACT}$$

$$\frac{A \neq B}{\mathsf{unbox}_A\,(\mathsf{box}_B\,t) \rightsquigarrow \mathsf{error}}\ \text{RD\_RETRACTE}$$

$$\frac{}{\mathsf{split}_U\,(\mathsf{squash}_U\,t) \rightsquigarrow t}\ \text{RD\_RETRACTU}$$

$$\frac{U_1 \neq U_2}{\mathsf{split}_{U_1}\,(\mathsf{squash}_{U_2}\,t) \rightsquigarrow \mathsf{error}}\ \text{RD\_RETRACTUE}$$

$$\frac{t \rightsquigarrow t'}{\mathsf{succ}\ t \rightsquigarrow \mathsf{succ}\ t'}\ \text{RD\_SUCC}$$

$$\frac{}{\mathsf{case}\,0\,\mathsf{of}\,0 \to t_1, (\mathsf{succ}\,x) \to t_2 \rightsquigarrow t_1}\ \text{RD\_NCASE0}$$

$$\frac{}{\mathsf{case}\,(\mathsf{succ}\,t)\,\mathsf{of}\,0 \to t_1, (\mathsf{succ}\,x) \to t_2 \rightsquigarrow [t/x]t_2}\ \text{RD\_NCASESUCC}$$

$$\frac{t \rightsquigarrow t'}{\mathsf{case}\,t\,\mathsf{of}\,0 \to t_1, (\mathsf{succ}\,x) \to t_2 \rightsquigarrow \mathsf{case}\,t'\,\mathsf{of}\,0 \to t_1, (\mathsf{succ}\,x) \to t_2}\ \text{RD\_NCASE1}$$

$$\frac{t_1 \rightsquigarrow t_1'}{\mathsf{case}\,t\,\mathsf{of}\,0 \to t_1, (\mathsf{succ}\,x) \to t_2 \rightsquigarrow \mathsf{case}\,t\,\mathsf{of}\,0 \to t_1', (\mathsf{succ}\,x) \to t_2}\ \text{RD\_NCASE2}$$

$$\frac{t_2 \rightsquigarrow t_2'}{\mathsf{case}\,t\,\mathsf{of}\,0 \to t_1, (\mathsf{succ}\,x) \to t_2 \rightsquigarrow \mathsf{case}\,t\,\mathsf{of}\,0 \to t_1, (\mathsf{succ}\,x) \to t_2'}\ \text{RD\_NCASE3}$$

$$\frac{}{\mathsf{case}\,[]\,\mathsf{of}\,[] \to t_1, (x :: y) \to t_2 \rightsquigarrow t_1}\ \text{RD\_LCASEEMPTY}$$

$$\frac{}{\mathsf{case}\,(t_1 :: t_2)\,\mathsf{of}\,[] \to t_3, (x :: y) \to t_4 \rightsquigarrow [t_1/x][t_2/y]t_4}\ \text{RD\_LCASECONS}$$

$$\frac{t_1 \rightsquigarrow t_1'}{t_1 :: t_2 \rightsquigarrow t_1' :: t_2}\ \text{RD\_HEAD}$$

$$\frac{t_2 \rightsquigarrow t_2'}{t_1 :: t_2 \rightsquigarrow t_1 :: t_2'}\ \text{RD\_TAIL}$$

$$\frac{t \rightsquigarrow t'}{\mathsf{case}\,t\,\mathsf{of}\,[] \to t_1, (x :: y) \to t_2 \rightsquigarrow \mathsf{case}\,t'\,\mathsf{of}\,[] \to t_1, (x :: y) \to t_2}\ \text{RD\_LCASE1}$$

$$\frac{t_1 \rightsquigarrow t_1'}{\mathsf{case}\,t\,\mathsf{of}\,[] \to t_1, (x :: y) \to t_2 \rightsquigarrow \mathsf{case}\,t\,\mathsf{of}\,[] \to t_1', (x :: y) \to t_2}\ \text{RD\_LCASE2}$$

$$\frac{t_2 \rightsquigarrow t_2'}{\mathsf{case}\ t\ \mathsf{of}\ [] \to t_1, (x :: y) \to t_2 \rightsquigarrow \mathsf{case}\ t\ \mathsf{of}\ [] \to t_1, (x :: y) \to t_2'}\ \text{RD\_LCASE3}$$

$$\frac{}{(\lambda(x : A_1).t_2)\ t_1 \rightsquigarrow [t_1/x]t_2}\ \text{RD\_BETA}$$

$$\frac{x \notin \mathsf{FV}(t)}{\lambda(x : A_1).t\ x \rightsquigarrow t}\ \text{RD\_ETA}$$

$$\frac{}{\mathsf{fst}\ (t_1, t_2) \rightsquigarrow t_1}\ \text{RD\_PROJ1}$$

$$\frac{}{\mathsf{snd}\ (t_1, t_2) \rightsquigarrow t_2}\ \text{RD\_PROJ2}$$

$$\frac{}{(\mathsf{fst}\ t, \mathsf{snd}\ t) \rightsquigarrow t}\ \text{RD\_ETAP}$$

$$\frac{t_1 \rightsquigarrow t_1'}{t_1\ t_2 \rightsquigarrow t_1'\ t_2}\ \text{RD\_APP1}$$

$$\frac{t_2 \rightsquigarrow t_2'}{t_1\ t_2 \rightsquigarrow t_1\ t_2'}\ \text{RD\_APP2}$$

$$\frac{t \rightsquigarrow t'}{\mathsf{fst}\ t \rightsquigarrow \mathsf{fst}\ t'}\ \text{RD\_FST}$$

$$\frac{t \rightsquigarrow t'}{\mathsf{snd}\ t \rightsquigarrow \mathsf{snd}\ t'}\ \text{RD\_SND}$$

$$\frac{t_1 \rightsquigarrow t_1'}{(t_1, t_2) \rightsquigarrow (t_1', t_2)}\ \text{RD\_PAIR1}$$

$$\frac{t_2 \rightsquigarrow t_2'}{(t_1, t_2) \rightsquigarrow (t_1, t_2')}\ \text{RD\_PAIR2}$$

$$\frac{}{[A](\Lambda(X <: B).t) \rightsquigarrow [A/X]t}\ \text{RD\_TYPEBETA}$$

$$\frac{t_1 \rightsquigarrow t_2}{[A]t_1 \rightsquigarrow [A]t_2}\ \text{RD\_TYPEAPP}$$

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Definition rules:          69 good    0 bad
Definition rule clauses: 124 good    0 bad
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