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

$t,\ c,\ v,\ s,\ n$	::=		
	|	x	
	|	triv	
	|	squash_S	
	|	split_S	
	|	box	
	|	box_A	
	|	unbox_A	
	|	unbox	
	|	$\Lambda(X <: A).t$	
	|	$[A]t$	
	|	$\lambda(x : A).t$	
	|	$t_1\, t_2$	
	|	(t_1, t_2)	
	|	$\mathsf{fst}\, t$	
	|	$\mathsf{snd}\, t$	
	|	$\mathsf{succ}\, t$	
	|	0	
	|	$\mathsf{ncase}\, t\, \mathsf{of}\, 0 \rightarrow t_1, t' \rightarrow t_2$	
	|	$[]$	
	|	$t :: t'$	
	|	$\mathsf{lcase}\, t\, \mathsf{of}\, [] \rightarrow t_1, t' \rightarrow t_2$	
	|	(t)	S
K	::=		
	|	$\star$	
$A,\ B,\ C,\ D,\ E,\ S,\ U$	::=		
	|	X	
	|	$\mathsf{List}\, A$	
	|	$\forall(X <: A).B$	
	|	$\top$	
	|	$\mathbb{S}$	
	|	Unit	
	|	Nat	
	|	$?$	
	|	$A_1 \rightarrow A_2$	
	|	$A_1 \times A_2$	
	|	(A)	S
Γ	::=		
	|	$\cdot$	
	|	$\Gamma, X <: A$	
	|	$\Gamma, x : A$	

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\frac{\Gamma\, \mathrm{Ok}}{\Gamma \vdash A <: A} \quad \text{S\_REFL}$$

$$\frac{\Gamma \vdash A <: B \quad \Gamma \vdash B <: C}{\Gamma \vdash A <: C} \quad \text{S\_TRANS}$$

$$\frac{\Gamma\, \mathrm{Ok}}{\Gamma \vdash A <: \top} \quad \text{S\_TOP}$$

$$\frac{\Gamma\, \mathrm{Ok}}{\Gamma \vdash \mathsf{Nat} <: \mathbb{S}} \quad \text{S\_NAT}$$

$$\frac{\Gamma\, \mathrm{Ok}}{\Gamma \vdash \mathsf{Unit} <: \mathbb{S}} \quad \text{S\_UNIT}$$

$$\frac{\Gamma \vdash A <: \mathbb{S}}{\Gamma \vdash \mathsf{List}\, A <: \mathbb{S}} \quad \text{S\_LISTSL}$$

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

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

$$\frac{\Gamma \vdash A <: \mathbb{S} \quad \Gamma \vdash B <: \mathbb{S}}{\Gamma \vdash A \to B <: \mathbb{S}} \quad \text{S\_ARROWSL}$$

$$\frac{\Gamma \vdash A <: \mathbb{S} \quad \Gamma \vdash B <: \mathbb{S}}{\Gamma \vdash A \times B <: \mathbb{S}} \text{ S\_ProdSL}$$

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

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

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

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

$$\frac{x : A \in \Gamma \quad \Gamma\,\mathrm{Ok}}{\Gamma \vdash x : A} \text{ varP}$$

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

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

$$\frac{\Gamma\,\mathrm{Ok}}{\Gamma \vdash \mathsf{squash}_U : U \to ?} \text{ squashP}$$

$$\frac{\Gamma\,\mathrm{Ok}}{\Gamma \vdash \mathsf{split}_U : ? \to U} \text{ splitP}$$

$$\frac{\Gamma\,\mathrm{Ok}}{\Gamma \vdash \mathsf{triv} : \mathsf{Unit}} \text{ unitP}$$

$$\frac{\Gamma\,\mathrm{Ok}}{\Gamma \vdash 0 : \mathsf{Nat}} \text{ zeroP}$$

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

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

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

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

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

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

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

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

$$\frac{\Gamma, x : A \vdash t : B}{\Gamma \vdash \lambda(x : A).t : A \to B} \quad \textsc{lam}$$

$$\frac{\Gamma \vdash t_1 : A \to B \quad \Gamma \vdash t_2 : A}{\Gamma \vdash t_1\, t_2 : B} \quad \textsc{app}$$

$$\frac{\Gamma, X <: A \vdash t : B}{\Gamma \vdash \Lambda(X <: A).t : \forall(X <: A).B} \quad \textsc{Lam}$$

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

$$\frac{\Gamma \vdash t : A \quad \Gamma \vdash A <: B}{\Gamma \vdash t : B} \quad \textsc{Sub}$$

$\boxed{t_1 \rightsquigarrow t_2}$

$$\frac{\cdot \vdash t : A}{\mathsf{unbox}_A\,(\mathsf{box}_B\; t) \rightsquigarrow t} \quad \textsc{rd\_retractT}$$

$$\frac{\cdot \vdash t : U}{\mathsf{split}_U\,(\mathsf{squash}_U\; t) \rightsquigarrow t} \quad \textsc{rd\_retractU}$$

$$\frac{t \rightsquigarrow t'}{\mathsf{succ}\; t \rightsquigarrow \mathsf{succ}\; t'} \quad \textsc{rd\_succ}$$

$$\frac{}{\mathsf{ncase}\; 0\; \mathsf{of}\; 0 \to t_1, (\mathsf{succ}\; x) \to t_2 \rightsquigarrow t_1} \quad \textsc{rd\_ncase0}$$

$$\frac{}{\mathsf{ncase}\;(\mathsf{succ}\; t)\; \mathsf{of}\; 0 \to t_1, (\mathsf{succ}\; x) \to t_2 \rightsquigarrow [t/x]t_2} \quad \textsc{rd\_ncaseSucc}$$

$$\frac{t \rightsquigarrow t'}{\mathsf{ncase}\; t\; \mathsf{of}\; 0 \to t_1, (\mathsf{succ}\; x) \to t_2 \rightsquigarrow \mathsf{ncase}\; t'\; \mathsf{of}\; 0 \to t_1, (\mathsf{succ}\; x) \to t_2} \quad \textsc{rd\_ncase1}$$

$$\frac{t_1 \rightsquigarrow t_1'}{\mathsf{ncase}\; t\; \mathsf{of}\; 0 \to t_1, (\mathsf{succ}\; x) \to t_2 \rightsquigarrow \mathsf{ncase}\; t\; \mathsf{of}\; 0 \to t_1', (\mathsf{succ}\; x) \to t_2} \quad \textsc{rd\_ncase2}$$

$$\frac{t_2 \rightsquigarrow t_2'}{\mathsf{ncase}\; t\; \mathsf{of}\; 0 \to t_1, (\mathsf{succ}\; x) \to t_2 \rightsquigarrow \mathsf{ncase}\; t\; \mathsf{of}\; 0 \to t_1, (\mathsf{succ}\; x) \to t_2'} \quad \textsc{rd\_ncase3}$$

$$\frac{}{\mathsf{lcase}\; []\; \mathsf{of}\; [] \to t_1, (x :: y) \to t_2 \rightsquigarrow t_1} \quad \textsc{rd\_lcaseEmpty}$$

$$\frac{}{\mathsf{lcase}\;(t_1 :: t_2)\; \mathsf{of}\; [] \to t_3, (x :: y) \to t_4 \rightsquigarrow [t_1/x][t_2/y]t_4} \quad \textsc{rd\_lcaseCons}$$

$$\frac{t_1 \rightsquigarrow t_1'}{t_1 :: t_2 \rightsquigarrow t_1' :: t_2} \quad \textsc{rd\_head}$$

$$\frac{t_2 \rightsquigarrow t_2'}{t_1 :: t_2 \rightsquigarrow t_1 :: t_2'} \quad \textsc{rd\_tail}$$

$$\frac{t \rightsquigarrow t'}{\mathsf{lcase}\; t\; \mathsf{of}\; [] \to t_1, (x :: y) \to t_2 \rightsquigarrow \mathsf{lcase}\; t'\; \mathsf{of}\; [] \to t_1, (x :: y) \to t_2} \quad \textsc{rd\_lcase1}$$

$$\frac{t_1 \rightsquigarrow t_1'}{\mathsf{lcase}\; t\; \mathsf{of}\; [] \to t_1, (x :: y) \to t_2 \rightsquigarrow \mathsf{lcase}\; t\; \mathsf{of}\; [] \to t_1', (x :: y) \to t_2} \quad \textsc{rd\_lcase2}$$

$$\frac{t_2 \rightsquigarrow t_2'}{\mathsf{lcase}\; t\; \mathsf{of}\; [] \to t_1, (x :: y) \to t_2 \rightsquigarrow \mathsf{lcase}\; t\; \mathsf{of}\; [] \to t_1, (x :: y) \to t_2'} \quad \textsc{rd\_lcase3}$$

$$\frac{}{(\lambda(x:A_1).t_2)\,t_1 \rightsquigarrow [t_1/x]t_2}\quad \textsc{rd\_beta}$$

$$\frac{x \notin \mathsf{FV}(t)}{\lambda(x:A_1).t\,x \rightsquigarrow t}\quad \textsc{rd\_eta}$$

$$\frac{}{\mathsf{fst}\,(t_1, t_2) \rightsquigarrow t_1}\quad \textsc{rd\_proj}1$$

$$\frac{}{\mathsf{snd}\,(t_1, t_2) \rightsquigarrow t_2}\quad \textsc{rd\_proj}2$$

$$\frac{}{(\mathsf{fst}\,t, \mathsf{snd}\,t) \rightsquigarrow t}\quad \textsc{rd\_eta}\mathrm{P}$$

$$\frac{t \rightsquigarrow t'}{\lambda(x:A).t \rightsquigarrow \lambda(x:A).t'}\quad \textsc{rd\_lam}$$

$$\frac{t_1 \rightsquigarrow t_1'}{t_1\;t_2 \rightsquigarrow t_1'\;t_2}\quad \textsc{rd\_app}1$$

$$\frac{t_2 \rightsquigarrow t_2'}{t_1\;t_2 \rightsquigarrow t_1\;t_2'}\quad \textsc{rd\_app}2$$

$$\frac{t \rightsquigarrow t'}{\mathsf{fst}\,t \rightsquigarrow \mathsf{fst}\,t'}\quad \textsc{rd\_fst}$$

$$\frac{t \rightsquigarrow t'}{\mathsf{snd}\,t \rightsquigarrow \mathsf{snd}\,t'}\quad \textsc{rd\_snd}$$

$$\frac{t_1 \rightsquigarrow t_1'}{(t_1, t_2) \rightsquigarrow (t_1', t_2)}\quad \textsc{rd\_pair}1$$

$$\frac{t_2 \rightsquigarrow t_2'}{(t_1, t_2) \rightsquigarrow (t_1, t_2')}\quad \textsc{rd\_pair}2$$

$$\frac{}{[A](\Lambda(X <: B).t) \rightsquigarrow [A/X]t}\quad \textsc{rd\_type}\mathrm{B}\textsc{eta}$$

$$\frac{t_1 \rightsquigarrow t_2}{[A]t_1 \rightsquigarrow [A]t_2}\quad \textsc{rd\_type}\mathrm{A}\textsc{pp}$$

$$\frac{t_1 \rightsquigarrow t_2}{\Lambda(X <: A).t_1 \rightsquigarrow \Lambda(X <: A).t_2}\quad \textsc{rd\_}\mathrm{L}\textsc{am}$$

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Definition rules:        74 good    0 bad
Definition rule clauses: 135 good    0 bad
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