

A New rules added to DTS

A.1 Structural rules of CMTT

$$\begin{array}{c}
 \Delta ; (\Gamma, x : A, \Gamma') \\
 \hline
 (hyp) \quad x : A
 \end{array}
 \qquad
 \begin{array}{c}
 u :: A[\Psi] \\
 \vdots \\
 \sigma : \Psi \\
 \hline
 (ctxhyp) \quad clo(u, \sigma) : A
 \end{array}$$

A.2 Rules for $\langle \Psi \rangle$

$$\begin{array}{c}
 \overline{\Psi}^i \\
 \Psi \text{ context} \quad \vdots \\
 A : \text{type} \\
 \hline
 (\diamond F), i \quad \langle \Psi \rangle A : \text{type}
 \end{array}
 \qquad
 \begin{array}{c}
 E : A \text{ poss } \langle \Psi \rangle \\
 \hline
 (\diamond I) \quad dia(E) : \langle \Psi \rangle A
 \end{array}
 \qquad
 \begin{array}{c}
 \overline{\Psi}^i \quad \overline{x : A}^i \\
 M : \langle \Psi \rangle A \quad \vdots \\
 E : B \text{ poss } \langle \Theta \rangle \\
 \hline
 (\diamond E), i \quad letdia(M, \langle \Psi, x \rangle . E) : B \text{ poss } \langle \Theta \rangle
 \end{array}$$

A.3 Rules for $[\Psi]$

$$\begin{array}{c}
 \overline{\Psi}^i \\
 \Psi \text{ context} \quad \vdots \\
 A : \text{type} \\
 \hline
 (\Box F), i \quad [\Psi] A : \text{type}
 \end{array}
 \qquad
 \begin{array}{c}
 \overline{\Psi}^i \\
 \vdots \\
 M : A \\
 \hline
 (\Box I), i \quad box(\Psi.M) : [\Psi] A
 \end{array}
 \qquad
 \begin{array}{c}
 \overline{u :: A[\Psi]}^i \\
 M : [\Psi] A \quad \vdots \\
 N : C \\
 \hline
 (\Box E), i \quad letbox(M, u.N) : C
 \end{array}$$

A.4 Rules for **poss**

$$\begin{array}{c}
 \overline{\sigma : \Psi}^i \\
 \sigma : \Psi \text{ context} \quad \vdots \\
 A : \text{type} \\
 \hline
 (poss F), i \quad A \text{ poss } \langle \sigma : \Psi \rangle : \text{type}
 \end{array}
 \qquad
 \begin{array}{c}
 \sigma : \Psi \quad M : A \\
 \hline
 (poss I) \quad \langle \sigma, M \rangle : A \text{ poss } \langle \sigma : \Psi \rangle
 \end{array}
 \qquad
 \begin{array}{c}
 M : A \text{ poss } \langle \sigma : \Psi \rangle \\
 \hline
 (poss E) \quad p2(M) : A \quad (\sigma \in fv(M))
 \end{array}$$