Règles de typage du μ-calcul

Règles actuelles [1]

$$\frac{}{\Gamma \vdash \top : \bullet} \qquad \frac{\Gamma \vdash \Phi_1 : \bullet \qquad \Gamma \vdash \Phi_2 : \bullet}{\Gamma \vdash \Phi_1 \wedge \Phi_2 : \bullet} \qquad \frac{\overline{\Gamma} \vdash \Phi : \tau}{\Gamma \vdash \neg\Phi : \tau}$$

$$\frac{\Gamma \vdash \Phi : \bullet}{\{\sqcup\} \circ \Gamma \vdash \langle a \rangle_i \Phi : \bullet} \qquad \frac{\Gamma \vdash \Phi : \bullet}{\Gamma \vdash \{\vec{i} \leftarrow \vec{j}\}\Phi : \bullet} \qquad \frac{\upsilon \subseteq \{\sqcap, \sqcup\} \text{ or } \upsilon = any}{\Gamma, X^\upsilon : \tau \vdash X : \tau}$$

$$\frac{\Gamma_1 \vdash \mathfrak{F} : \bullet^\upsilon \to \tau \qquad \Gamma_2 \vdash \Phi : \bullet}{\Gamma \vdash \mathfrak{F}\Phi : \tau} \; {\scriptstyle \begin{array}{l}\Gamma \preceq \Gamma_1 \\ \Gamma \preceq \upsilon \circ \Gamma_2\end{array}}$$

$$\frac{\Gamma, X^\varnothing : \tau \vdash \Phi}{\Gamma \vdash \mu X : \tau \,.\, \Phi} \; X \notin vars(\Gamma) \qquad \frac{\Gamma, X^\upsilon : \bullet \vdash \Phi : \tau}{\Gamma \vdash \lambda X^\upsilon : \bullet \,.\, \Phi : \bullet^\upsilon \to \tau} \; X \notin vars(\Gamma)$$

Nouvelles règles

On pose type(f) = (Γ, τ) avec f, une formule écrite selon les règles du μ-calcul, Γ, l'environnement de typage de f et τ, le type de f.
Dans la suite, $\emptyset$ représente l'environnement de typage vide.

$$\frac{}{type(\top) = (\emptyset, \bullet)} \qquad \frac{type(\Phi_1) = (\Gamma_1, \bullet) \qquad type(\Phi_2) = (\Gamma_2, \bullet)}{type(\Phi_1 \wedge \Phi_2) = (\Gamma_1 \cap \Gamma_2, \bullet)} \; ???$$

$$\frac{type(\Phi) = (\Gamma, \tau)}{type(\neg\Phi) = (\overline{\{\sqcap, \sqcup\}} \circ \Gamma, \tau)} \qquad \frac{type(\Phi) = (\Gamma, \bullet)}{type(\langle a \rangle_i \Phi) = (\{\sqcup\} \circ \Gamma, \bullet)}$$

$$\frac{type(\Phi) = (\Gamma, \bullet)}{type(\{\vec{i} \leftarrow \vec{j}\}\Phi) = (\Gamma, \bullet)} \qquad \frac{\upsilon \subseteq \{\sqcap, \sqcup\} \text{ or } \upsilon = any}{type(X) = (\upsilon, \tau)} \; ???$$

$$\frac{\dfrac{type(e) = (\upsilon, \bullet)}{type(\mathfrak{F}) = (\Gamma_1, e \to \tau)} \qquad type(\Phi) = (\Gamma_2, \bullet)}{type(\mathfrak{F}\Phi) = (\Gamma, \tau)} \; {\scriptstyle \begin{array}{l}\Gamma \preceq \Gamma_1 \\ \Gamma \preceq \upsilon \circ \Gamma_2\end{array}} ???$$

$$\frac{\Gamma, X^\varnothing : \tau \vdash \Phi}{\Gamma \vdash \mu X : \tau \,.\, \Phi} \; X \notin vars(\Gamma) \qquad \frac{\Gamma, X^\upsilon : \bullet \vdash \Phi : \tau}{\Gamma \vdash \lambda X^\upsilon : \bullet \,.\, \Phi : \bullet^\upsilon \to \tau} \; X \notin vars(\Gamma)$$

Références

[1] Lange, M., Lozes, E., Vargas Guzmán, M. : Model-checking process equivalences. Theoretical Computer Science **560**, 326 – 347 (2014). https ://doi.org/https ://doi.org/10.1016/j.tcs.2014.08.020, `http://www.sciencedirect.com/science/article/pii/S0304397514006574`, games, Automata, Logic and Formal Verification