COMPSCI 3MI3 - Principles of Programming Languages

Types for references and memory

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Adapted from "Types and Programming Languages" by Benjamin C. Pierce

Sums

$$\langle t \rangle ::= \ldots \mid \text{inl t} \mid \text{inr t} \mid \text{case t of inl x} \Rightarrow \text{t} \mid \text{inr x} \Rightarrow \text{t}$$

$$\langle v \rangle ::= \text{inl v} \mid \text{inr v}$$

$$\langle T \rangle ::= \ldots \mid \text{T} + \text{T}$$

Evaluation rules

$$\frac{\mathit{case}\ (\mathit{inl}\ v_0)\ \mathit{of}\ \mathit{inl}\ x_1 \Rightarrow t_1 \mid \mathit{inr}\ x_2 \Rightarrow t_2}{[x_1 \mapsto v_0]\, t_1} \quad \text{(E-CaseInl)}$$

$$\frac{\mathit{case}\ (\mathit{inr}\ v_0)\ \mathit{of}\ \mathit{inl}\ x_1 \Rightarrow t_1 \mid \mathit{inr}\ x_2 \Rightarrow t_2}{[x_2 \mapsto v_0]\, t_2} \quad \text{(E-CaseInr)}$$

$$\frac{t_0 \to t_0'}{\mathit{case}\ t_0\ \mathit{of}\ \mathit{inl}\ x_1 \Rightarrow t_1 \mid \mathit{inr}\ x_2 \Rightarrow t_2 \to \mathit{case}\ t_0'\ \mathit{of}\ \mathit{inl}\ x_1 \Rightarrow t_1 \mid \mathit{inr}\ x_2 \Rightarrow t_2} \quad \text{(E-Case)}$$

Sums

$$\frac{t_1 \to t_1'}{inl\ t_1 \to t_1'} \quad \text{(E-Inl)}$$

$$\frac{t_1 \to t_1'}{inr\ t_1 \to t_1'} \quad \text{(E-Inr)}$$

Typing rules

$$\frac{\Gamma \vdash t_1 : T_1}{\Gamma \vdash \texttt{inl}\ \ t_1 : T_1 + T_2} \quad \text{(T-Inl)}$$

$$\frac{\Gamma \vdash t_1 : T_2}{\Gamma \vdash \texttt{inr}\ \ t_1 : T_1 + T_2} \quad \text{(T-Inr)}$$

$$\frac{\Gamma \vdash t_0 : T_1 + T_2 \quad \Gamma, x_1 : t_1 \vdash t_1 : T \quad \Gamma, x_2 : t_2 \vdash t_2 : T}{\Gamma \vdash case\ t_0\ of\ inl\ x_1 \Rightarrow t_1 \mid inr\ x_2 \Rightarrow t_2 : T} \quad \text{(T-Case)}$$