

Lacs context-sensitive specification rules

Metavariable definitions

$$E \in \{\text{expnas, expra, expr, term, factor}\} \quad \tau \in \{\text{type}\}$$

Type derivation rules

<p>LITERAL</p> $\frac{}{\Gamma \vdash \mathbf{NUM} : \mathbf{Int}}$	<p>VARIABLE</p> $\frac{\Gamma(\mathbf{ID}) = \mathbf{var ID} : \tau}{\Gamma \vdash \mathbf{ID} : \tau}$	<p>PROCEDURE</p> $\frac{\Gamma(\mathbf{ID}) = \mathbf{def ID}(\overline{\mathbf{ID} : \tau}) : \tau}{\Gamma \vdash \mathbf{ID} : (\bar{\tau}) \Rightarrow \tau}$	<p>PARENTHESES</p> $\frac{\Gamma \vdash E : \tau}{\Gamma \vdash (E) : \tau}$
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ARITHMETIC

$$\frac{\Gamma \vdash E_1 : \mathbf{Int} \quad \Gamma \vdash E_2 : \mathbf{Int}}{\Gamma \vdash E_1 + E_2 : \mathbf{Int} \quad \Gamma \vdash E_1 - E_2 : \mathbf{Int} \quad \Gamma \vdash E_1 * E_2 : \mathbf{Int} \quad \Gamma \vdash E_1 / E_2 : \mathbf{Int} \quad \Gamma \vdash E_1 \% E_2 : \mathbf{Int}}$$

ASSIGNMENT

$$\frac{\Gamma(\mathbf{ID}) = \tau \quad \Gamma \vdash E : \tau}{\Gamma \vdash \mathbf{ID} = E : \tau}$$

SEQUENCING

$$\frac{\Gamma \vdash E_1 : \tau' \quad \Gamma \vdash E_2 : \tau}{\Gamma \vdash E_1; E_2 : \tau}$$

IF STATEMENT

$$\frac{\Gamma \vdash E_1 : \mathbf{Int} \quad \Gamma \vdash E_2 : \mathbf{Int} \quad \Gamma \vdash E_3 : \tau \quad \Gamma \vdash E_4 : \tau}{\Gamma \vdash \mathbf{if}(E_1 == E_2) E_3 \mathbf{else} E_4 : \tau \quad \Gamma \vdash \mathbf{if}(E_1 != E_2) E_3 \mathbf{else} E_4 : \tau \quad \Gamma \vdash \mathbf{if}(E_1 <= E_2) E_3 \mathbf{else} E_4 : \tau \quad \Gamma \vdash \mathbf{if}(E_1 => E_2) E_3 \mathbf{else} E_4 : \tau \quad \Gamma \vdash \mathbf{if}(E_1 < E_2) E_3 \mathbf{else} E_4 : \tau \quad \Gamma \vdash \mathbf{if}(E_1 > E_2) E_3 \mathbf{else} E_4 : \tau}$$

PROCEDURE CALL

$$\frac{\Gamma \vdash E' : (\bar{\tau}) \Rightarrow \tau' \quad \forall i. \Gamma \vdash E_i : \tau_i}{\Gamma \vdash E'(\overline{E}) : \tau'}$$

Well-formedness rules

PROCEDURE DECLARATION

$$\frac{\forall i. \Gamma, \overline{\text{vardef}}, \overline{\text{vardef}'}, \overline{\text{defdef}} \vdash \text{defdef}_i \quad \text{all names in } \overline{\text{vardef}}, \overline{\text{vardef}'}, \overline{\text{defdef}} \text{ distinct} \quad \Gamma, \overline{\text{vardef}}, \overline{\text{vardef}'}, \overline{\text{defdef}} \vdash E : \tau}{\Gamma \vdash \mathbf{def ID}(\overline{\text{vardef}}) : \tau = \{\overline{\text{vardef}'}, \overline{\text{defdef}}, E\}}$$

PROGRAM

$$\frac{\forall i. \overline{\text{defdef}} \vdash \text{defdef}_i}{\emptyset \vdash \overline{\text{defdef}}}$$