

Syntax

Literals	lit	$::= None \mid True \mid False \mid "a" \mid \dots \mid 1 \mid \dots$
Expression	Exp	$::= lit@(\overline{A}) \mid Exp.id \mid id_{Fun}(\overline{Exp})$ $\mid Exp.id_{Fun}(\overline{Exp}) \mid id_{Cls}@\overline{A}.\overline{Exp}$
Expression	$TExp$	$::= lit@(\overline{A}) : \tau \mid \dots$
	id_{Fun}	$::= f \mid g \mid \dots$
	id_{Cls}	$::= C \mid D \mid \dots$
Assign Op.	$AsgOp$	$\in \{=, +=, -=, *=, /=, \%=, /\} \}$
Binary Op.	$BinOp$	$\in \{ , \&\&, , \&, ==, !=, <, >, <=, >=, +, -, *, /, \%, **\}$

Projection To Python

$$\begin{aligned}
(Exp) \quad \langle lit@(\overline{B}) : \tau \rangle^A &= \begin{cases} lit & \text{if } A \in \overline{B} \\ \text{Unit.id} & \text{otherwise} \end{cases} \\
\langle Exp.id : \tau \rangle^A &= \begin{cases} \langle Exp \rangle^A.id & \text{if } A \in \text{rolesOf}(Exp.id) \\ \text{absent} & \text{otherwise} \end{cases} \\
\langle id_{Fun}(\overline{Exp}) : \tau \rangle^A &= \begin{cases} id_{Fun}(\langle \overline{Exp} \rangle^A) & \text{if } A \in \text{rolesOf}(id_{Fun}(\overline{Exp})) \\ \text{Unit.id}_{Fun}(\langle \overline{Exp} \rangle^A) & \text{otherwise} \end{cases} \\
\langle Exp.id_{Fun}(\overline{Exp}) : \tau \rangle^A &= \begin{cases} \langle Exp \rangle^A.id_{Fun}(\langle \overline{Exp} \rangle^A) & \text{if } A \in \text{rolesOf}(Exp) \wedge A \in \text{rolesOf}(\overline{Exp}) \\ \langle Exp \rangle^A.id_{Fun}(\langle \text{Unit.id} \rangle^A) & \text{if } A \in \text{rolesOf}(Exp) \wedge A \notin \text{rolesOf}(\overline{Exp}) \\ \text{Unit.id}_{Fun}(\langle \overline{Exp} \rangle^A, \langle \overline{Exp} \rangle^A) & \text{otherwise} \end{cases} \\
\langle id_{Cls}@\overline{B}(\overline{Exp}) : \tau \rangle^A &= \begin{cases} \langle id_{Cls}@\overline{B} \rangle^A(\langle \overline{Exp} \rangle^A) & A \in \overline{B} \\ \text{Unit.id}_{Cls}(\langle \overline{Exp} \rangle^A) & \text{otherwise} \end{cases} \\
\text{rolesOf}(- : \tau@(\overline{B})) &= \overline{B} \\
\text{rolesOf}(Exp.id : \tau) &= \overline{B} \quad \text{if } \text{rolesOf}(Exp) = \overline{B} \\
\text{rolesOf}(id_{Fun}(\overline{Exp}) : \tau) &= \overline{B} \quad \text{if } \text{rolesOf}(\overline{Exp}) = \overline{B} \\
\text{rolesOf}(Exp.id_{Fun}(\overline{Exp}) : \tau) &= \overline{B} \quad \text{if } \text{rolesOf}(Exp) = \overline{B}
\end{aligned}$$