

Ott v.0 Index

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x, f, n, s
 i

terminals ::=
| int
| string
| +
*
==
⊢
if
else
while
return
void
;
=
{
}
→
⇒
.

t ::=
| int
| r types

r ::=
| string reference types

rt ::=
| void
| t return types

ft ::=
| $(t_1, \dots, t_i) \rightarrow rt$ function types

<i>const</i>	$::=$ $\begin{array}{l} \quad n \\ \quad s \\ \quad 0 \end{array}$	constants	
<i>bop</i>	$::=$ $\begin{array}{l} \quad + \\ \quad * \\ \quad - \\ \quad == \end{array}$	binary operations	
<i>exp</i>	$::=$ $\begin{array}{l} \quad x \\ \quad const \\ \quad exp_1 \text{ bop } exp_2 \\ \quad f(exp_1, \dots, exp_i) \\ \quad (e) \end{array}$	expressions	M
<i>decl</i>	$::=$ $\begin{array}{l} \quad t \ x = exp \end{array}$	declarations	
<i>stmt</i>	$::=$ $\begin{array}{l} \quad decl; \\ \quad x = exp; \\ \quad f(exp_1, \dots, exp_i); \\ \quad \text{if}(exp) \ block_1 \ \text{else} \ block_2 \\ \quad \text{while}(exp) \ block \\ \quad \text{return } exp; \\ \quad \text{return}; \end{array}$	statements	
<i>block</i>	$::=$ $\begin{array}{l} \quad \{stmt_1 \dots stmt_i\} \end{array}$	blocks	
<i>prog</i>	$::=$ $\begin{array}{l} \quad stmt_1 \dots stmt_i \end{array}$	prog	
<i>L</i>	$::=$ $\begin{array}{l} \quad . \\ \quad x:t \\ \quad L_1, L_2 \\ \quad (L) \end{array}$	local contexts	M
<i>G</i>	$::=$ $\begin{array}{l} \quad . \end{array}$	global contexts	

		$f:ft$	
		G_1, G_2	
		(G)	M
$formula$	$::=$		
		$judgement$	
		$formula_1 \dots formula_i$	
		$x:t \in L$	
		$f:ft \in G$	
		$x \notin L$	
		$\dots$	
$TypeChecking$	$::=$		
		$\vdash const : t$	
		$\vdash bop : ft$	
		$G;L \vdash exp : t$	
		$G;L_1 \vdash decl \Rightarrow L_2$	
		$G;L_1;rt \vdash stmt \Rightarrow L_2$	
		$G;L;rt \vdash block$	
		$G;L_0;rt \vdash stmt_1 \dots stmt_i \Rightarrow L_i$	
		$\vdash prog$	
$judgement$	$::=$		
		$TypeChecking$	
$user_syntax$	$::=$		
		x	
		i	
		$terminals$	
		t	
		r	
		rt	
		ft	
		$const$	
		bop	
		exp	
		$decl$	
		$stmt$	
		$block$	
		$prog$	
		L	
		G	
		$formula$	

$\vdash const : t$

$\frac{}{\vdash n : \text{int}} \quad \text{TYP_INT}$

$\vdash \text{bop} : ft$

$\overline{\vdash s : \text{string}} \quad \text{TYP_STRING}$

$\overline{\vdash + : (\text{int}, \text{int}) \rightarrow \text{int}} \quad \text{TYP_ADD}$

$\overline{\vdash \star : (\text{int}, \text{int}) \rightarrow \text{int}} \quad \text{TYP_MUL}$

$\overline{\vdash - : (\text{int}, \text{int}) \rightarrow \text{int}} \quad \text{TYP_SUB}$

$G; L \vdash \text{exp} : t$

$\frac{\vdash \text{const} : t}{G; L \vdash \text{const} : t} \quad \text{TYP_CONST}$

$\frac{x:t \in L}{G; L \vdash x : t} \quad \text{TYP_VAR}$

$\frac{\vdash \text{bop} : (t_1, t_2) \rightarrow t \quad G; L \vdash \text{exp}_1 : t_1 \quad G; L \vdash \text{exp}_2 : t_2}{G; L \vdash \text{exp}_1 \text{bop} \text{exp}_2 : t} \quad \text{TYP_BOP}$

$\frac{f:(t_1, \dots, t_i) \rightarrow t \in G \quad G; L \vdash \text{exp}_1 : t_1 \quad \dots \quad G; L \vdash \text{exp}_i : t_i}{G; L \vdash f(\text{exp}_1, \dots, \text{exp}_i) : t} \quad \text{TYP_ECALL}$

$G; L_1 \vdash \text{decl} \Rightarrow L_2$

$\frac{G; L \vdash \text{exp} : t \quad x \notin L}{G; L \vdash t \ x = \text{exp} \Rightarrow L, x:t} \quad \text{TYP_DECL}$

$G; L_1; rt \vdash \text{stmt} \Rightarrow L_2$

$\frac{G; L_1 \vdash \text{decl} \Rightarrow L_2}{G; L_1; rt \vdash \text{decl}; \Rightarrow L_2} \quad \text{TYP_SDECL}$

$\frac{x:t \in L \quad G; L \vdash \text{exp} : t}{G; L; rt \vdash x = \text{exp}; \Rightarrow L} \quad \text{TYP_ASSN}$

$\frac{f:(t_1, \dots, t_i) \rightarrow \text{void} \in G \quad G; L \vdash \text{exp}_1 : t_1 \quad \dots \quad G; L \vdash \text{exp}_i : t_i}{G; L; rt \vdash f(\text{exp}_1, \dots, \text{exp}_i); \Rightarrow L} \quad \text{TYP_SCALL}$

$\frac{G; L \vdash \text{exp} : \text{int} \quad G; L; rt \vdash \text{block}_1 \quad G; L; rt \vdash \text{block}_2}{G; L; rt \vdash \text{if}(\text{exp}) \text{block}_1 \text{ else } \text{block}_2 \Rightarrow L} \quad \text{TYP_IF}$

$\frac{G; L \vdash \text{exp} : \text{int} \quad G; L; rt \vdash \text{block}}{G; L; rt \vdash \text{while}(\text{exp}) \text{block} \Rightarrow L} \quad \text{TYP_WHILE}$

$\frac{G; L \vdash \text{exp} : t}{G; L; t \vdash \text{return } \text{exp}; \Rightarrow L} \quad \text{TYP_RETT}$

$\overline{G; L; \text{void} \vdash \text{return}; \Rightarrow L} \quad \text{TYP_RETVoid}$

$G; L; rt \vdash \text{block}$

$$\frac{G;L_0;rt \vdash stmt_1 .. stmt_i \Rightarrow L_i}{G;L_0;rt \vdash \{stmt_1 .. stmt_i\}} \quad \text{TYP_BLOCK}$$

$$\boxed{G;L_0;rt \vdash stmt_1 .. stmt_i \Rightarrow L_i}$$

$$\frac{G;L_0;rt \vdash stmt_1 \Rightarrow L_1 \quad \dots \quad G;L_{i-1};rt \vdash stmt_i \Rightarrow L_i}{G;L_0;rt \vdash stmt_1 .. stmt_i \Rightarrow L_i} \quad \text{TYP_STMTS}$$

$$\boxed{\vdash prog}$$

$$\frac{G_0; \cdot; \text{int} \vdash stmt_1 .. stmt_i \Rightarrow L_i}{\vdash stmt_1 .. stmt_i} \quad \text{TYP_PROG}$$