# Typing rules for SmallC

## 1 Declarations

$$\textsc{VarDecl(Var)}\ \frac{\mathbf{T} \in \{\mathbf{int}, \mathbf{char}\}}{add\ \langle Var : \mathbf{T}\rangle\ to\ \Gamma}$$

$$\textsc{Procedure(f)}\ \frac{}{add\ \langle f : \overline{U} \to \mathbf{T}\rangle\ to\ \Gamma}$$

## 2 Expressions

$$\textsc{IntLiteral(i)}\ \frac{}{\Gamma \vdash i : \mathbf{int}} \qquad \textsc{StrLiteral(s)}\ \frac{}{\Gamma \vdash s : \mathbf{string}} \qquad \textsc{ChrLiteral(c)}\ \frac{}{\Gamma \vdash c : \mathbf{char}}$$

$$\textsc{Var}\ \frac{\vdash \langle Var : \mathbf{T}\rangle \in \Gamma}{\Gamma \vdash Var : \mathbf{T}}$$

$$\textsc{FunCallExpr(f)}\ \frac{\mathbf{T} \in \{\mathbf{int}, \mathbf{char}\} \qquad \vdash \langle f : \overline{U} \to \mathbf{T}\rangle \in \Gamma \qquad \Gamma \vdash \overline{Var} : \overline{U}}{\Gamma \vdash f(\overline{Var}) : \mathbf{T}}$$

$$\textsc{BinOp(Op=ADD,SUB,MUL,DIV,MOD)}\ \frac{\Gamma \vdash Expr_1 : \mathbf{int} \qquad \vdash Expr_2 : \mathbf{int}}{\Gamma \vdash Expr_1\ Op\ Expr_2 : \mathbf{int}}$$

$$\textsc{BinOp(Op=GT,LT,GE,LE,NE,EQ)}\ \frac{\Gamma \vdash Expr_1 : \mathbf{T} \qquad \vdash Expr_2 : \mathbf{T}}{\Gamma \vdash Expr_1\ Op\ Expr_2 : \mathbf{int}}$$

## 3 Statements

$$\textsc{FunCallStmt(f)}\ \frac{\vdash \langle f : \overline{U} \to \mathbf{T}\rangle \in \Gamma \qquad \Gamma \vdash \overline{Var} : \overline{U}}{\Gamma \vdash f(\overline{Var})}$$

$$\textsc{While}\ \frac{\Gamma \vdash Expr : \mathbf{int}}{\Gamma \vdash while(Expr)\ Stmt}$$

$$\textsc{If(no else)}\ \frac{\Gamma \vdash Expr : \mathbf{int}}{\Gamma \vdash if(Expr)\ Stmt} \qquad \textsc{If(with else)}\ \frac{\Gamma \vdash Expr : \mathbf{int}}{\Gamma \vdash if(Expr)\ Stmt_1\ else\ Stmt_2}$$

$$\textsc{Assign}\ \frac{\Gamma \vdash Var : \mathbf{T} \qquad \Gamma \vdash Expr : \mathbf{T}}{\Gamma \vdash Var = Expr}$$

$$\textsc{Return(from function f)}\ \frac{\Gamma \vdash f : \overline{U} \to \mathbf{T} \qquad \Gamma \vdash Expr : \mathbf{T}}{\Gamma \vdash return\ Expr}$$