

**COMSATS UNIVERSITY ISLAMABAD, ATTOCK CAMPUS**

**COMPILER CONSTRUCTION**

**LAB TERMINAL**

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**Q4: Explain functions that perform semantic analysis.**

The key is that semantic analysis operates on the Abstract Syntax Tree (AST) generated by the parser. The functions will likely traverse this tree, performing checks and storing information in the symbol table.

**Semantic Analysis Functions in maierfelix/mini-c:**

These functions, primarily located in compiler.cpp (or similar), traverse the Abstract Syntax Tree (AST) after parsing, performing essential checks before code generation. They use a symbol table to track declared variables and functions.

**Core Functions:**

compile(ASTNode\* root):

Entry point; orchestrates semantic analysis and code generation.

**analyzeProgram(ASTNode\* programNode, SymbolTable\* symtab):**

Analyzes the overall program structure; iterates through global declarations and statements.

**analyzeDeclaration(ASTNode\* declNode, SymbolTable\* symtab):**

Handles variable and function declarations; adds symbols to the symbol table.

**analyzeFunction(ASTNode\* funcNode, SymbolTable\* symtab):**

Analyzes function details (parameters and body); creates a local scope.

**analyzeParameter(ASTNode\* paramNode, SymbolTable\* symtab):**

Analyzes function parameter declarations.

**analyzeBlockStatement(ASTNode\* blockNode, SymbolTable\* symtab):**

Analyzes code blocks; manages scopes for variables.

**analyzeStatement(ASTNode\* stmtNode, SymbolTable\* symtab):**

Analyzes a single statement:

**analyzeAssignment:** Checks type compatibility of assignment.

**analyzeIfStatement:** Handles if conditions and blocks.

**analyzeWhileStatement:** Handles while loop conditions and blocks.

**analyzeFunctionCall:** Checks function calls.

Handles return and variable declarations.

**analyzeExpression(ASTNode\* exprNode, SymbolTable\* symtab):**

Analyzes expressions (arithmetic, literals, identifiers); performs type checking and symbol lookup.

**analyzeArgumentList(ASTNode\* argsNode, FunctionSymbol\* functionSymbol, SymbolTable\* symtab):**

Checks arguments passed in a function call against the formal parameters.