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Lab Terminal

Question # 5

Explain the functions which perform the syntactic analysis of MiniCompilerApp.

Answer

In a MiniCompilerApp, semantic analysis checks the logical correctness of the code, ensuring variables are declared before use, types are compatible, and expressions are semantically valid. Here are the key functions involved in semantic analysis:

Functions Performing Semantic Analysis:

1. Symbol Table Management:

This function stores variable names, types, and values. During semantic analysis, it checks if variables are correctly declared and ensures type consistency.

Example: For `int so = 100;`, the symbol table will store the entry:

Name: so, Type: int, Value: 100

2. Type Checking:

This function ensures that operations and assignments are done between compatible types (e.g., integers are assigned to integer variables).

Example: The code `int so = 100;` passes type checking because `so` is declared as an integer, and `100` is an integer.

3. Variable Declaration Check:

This function ensures that variables are declared before they are used. If a variable is used without declaration, it results in an error.

Example: If so were used before being declared, this function would raise an error.

4. Constant Folding (Optimization):

Although primarily for optimization, constant folding is part of semantic analysis when constants are evaluated at compile time and stored in the symbol table.

Example:

Input:

```
int so = 100;
```

Output:

Compilation Successful

Name: so, Type: int, Value: 100

Explanation:

- Symbol Table: The symbol so is added with its type and value.
- Type Checking: Confirms that 100 is compatible with the type int.
- No Errors: The variable is declared and assigned correctly, so the compilation is successful.

Functions involved:

- addVariable(name, type, value): Adds the variable to the symbol table.
- checkVariableDeclaration(name): Ensures the variable is declared before use.
- checkTypeCompatibility(varType, value): Verifies type compatibility between variable and value.

These functions ensure that the code is logically correct before generating the final output.