Carbonic-C - Semantic Analyzer
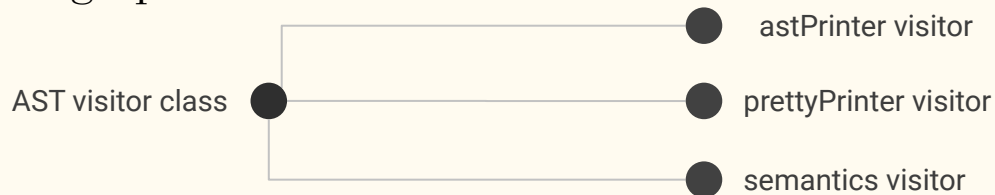
—

Asem, Jaffar, Menna, Mosab

AST Traversal

- Utilize the use of visitor design pattern

AST visitor class — astPrinter visitor

AST visitor class — prettyPrinter visitor

AST visitor class — semantics visitor

```
62      class Visitor
63      {
64      public:
65          virtual void visitProgram(Program *p) = 0;
66          virtual void visitDecl(Decl *p) = 0;
67          virtual void visitRoutineDecl(RoutineDecl *p) = 0;
```

AST Printer

```
You, 3 weeks ago | 1 author (You)
1  routine main () : integer is
2
3      var x : integer is 2 + 3;
4
5      print(x);
6
7      return 0;
8  end
```

```
1
2  - Program
3  |- RoutineDecl
4  ||- Ident
5  |||- main
6  ||- IntegerType
7  ||- Body
8  |||- LocalVarDecl
9  ||||- Ident
10 |||||- x
11 ||||- IntegerType
12 ||||- BinaryExpr
13 |||||- IntegerValue
14 ||||||- 2
15 |||||- +
16 |||||- IntegerValue
17 ||||||- 3
18 |||- Print
19 |||- Return
20 ||||- IntegerValue
21 |||||- 0
22
```

Pretty Printer

```
routine main () : integer is

    var x : integer is 2 + 3;

    print(x);

    return 0;
end
```

```
routine main() : integer is
    var x : integer is (2 + 3);
    print(x);
    return 0;
end
```

Semantic Analysis

- Function, Variable, and Type Declaration Checks
- Type Checks
- Shadowing Warnings

Definition Checks

```
Jaffar Totanji, 20 hours ago | 1 author (Jaffar Totanji)
1   routine div (x : real, y : real) is
2
3       var z : real;
4       z := x / b;
5
6       return z;
7   end
8
9   routine main () : integer is
10
11      var x : real is div( 4.4 , 2.2 );
12
13      if x > 1.1 then
14          print(1);
15      else
16          print(0);
17      end
18
19      return 0;
20  end
21
```

```
1
2   Error: Undefined object: b
3
```

Definition Checks Cont.

```
PATH242, 19 hours ago | 2 authors (Jaffar Totanji and others)
1   routine div (x : real, y : real) : real is
2
3       var z : real;
4       z := x / y;
5
6       return z;
7   end
8
9   routine main () : integer is
10
11      var x : real is divide( 4.4 , 2.2 );
12
13      if x > 1.1 then
14          print(1);
15      else
16          print(0);
17      end
18
19      return 0;
20  end        Jaffar Totanji, 20 hours ago • [add]
21
```

```
1
2   Error: Undefined object: divide
3
```

Type Checks

```
1  routine main () : integer is
2
3      var x : real is 2 + 3;
4
5      print(x);
6
7      return 0;
8  end
```

```
1
2  Error: Expected: Integer, got: Real
3  |
```

Shadowing

```
routine main (): boolean is          Jaffar Tot
    var x : integer is 0;

    if true then
        var x : boolean is 1; //shadowing
    end

    return 0;
end
```

```
Warning: Shadowing object: x
Error: Expected: Integer, got: Boolean
```

Team Contribution

Asem: AST Structure, Refactoring, Syntax and Lexical error handling

Jaffar: Automation, Testing, Syntax and Lexical error handling

Menna: Refactoring, Semantic Analysis

Mosab: Refactoring, Pretty Printer, AST Structure

Time for a Demo!

Upcoming Tasks

- CMake
- CTest (Better testing interface)
- Folder Structure
- Carbonic-C VSC extension
- Code Generation

Thank you!