CS614: Advanced Compilers

Autumn 2023 (Due: Sep 2^{nd}, 2023)

Assignment A1: Am I Your Type?

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1 Assignment Objective

Use JavaCC and JTB to perform type checking by traversing parse trees.

2 Detailed Specification

You are provided with a grammar file `minijava.jj`, which models a Java-like object-oriented programming language, consisting of classes, objects, integer variables and arrays, while loops, etc. Along with that a parser generated for that grammar using `Javacc`. You need to update the parser (`GJDepthFirst.java`) for type-checking minijava programs, and print the number of type errors therein. In particular:

- If the program has K (> 0) type errors, we should get the output "Found K type errors.", if it does.
- If the program has no type errors, we should get the output "Program type-checked successfully."

TO help you get started, we have added the schema of a few data structures and a few helper methods in `GJDepthFirst.java`, which are useful during type-checking. Also note that the input programs will neither have syntax errors nor any errors related to undeclared or multiply declared identifiers.

2.1 Example Input

```
class Test {
   public static void main(String[] args) {
      System.out.println(new A().foo(10));
   }
}
class A {
   public int foo(int p) {
      int x;
      boolean y;
      int z;
      int w;
      int q;
      x = 10;
      y = true;
      z = 0;
      if (z) { // Type error 1: non-boolean expression for if statement
         z = z + p;
         if (z != false) { // Type error 2: comparison between integer and boolean
```

```
            y = false;
         }
      }
      q = this.bar();
      return z;
   }
   public int bar() {
      int a;
      int b;
      a = 10;
      return a;
   }
}
class B extends A {}
```

2.2 Example Output

```
Found 3 type errors.
```

2.3 Evaluation

Your submission must be named `rollnum-a1.zip`, where `rollnum` is your roll-number in small letters. Upon unzipping the submission, we should get a directory named `rollnum-a1`. The main class inside this directory should be named `Main.java`. Your program should read from the standard input and print to the standard output. You can leave all the visitors and syntax-tree nodes as it is, but remember to remove all the `.class` files.

We would run the following commands in the evaluation script:

- `javac Main.java`
- `java Main < test > out`

If the contents of `out` match with the expected output for the testcase, you would get marks for the corresponding testcase.

3 Plagiarism Warning

You are allowed to discuss publicly on the Slack channel, but are supposed to do the assignment completely individually. If plagiarism is found:

- First instance: 0 marks in the assignment
- Second instance: FR grade in the course
- Third instance: report to institutional committee

-*-*-*- Do the assignment honestly, enjoy learning the course. -*-*-*-