Compilers: Principles, Techniques, and Tools

Fall 2005

Programming Assignment 4

Due Date: December 28, 2005

You are going to write a translation schema to execute the programs of the following toy programming language. The grammar of this toy programming language is:

program → decls compoundstmt
decls → decl **;** decls | ε
decl → **int ID = INTNUM** | **real ID = REALNUM**
stmt → ifstmt | assgstmt | compoundstmt
compoundstmt → **{** stmts **}**
stmts → stmt stmts | ε
ifstmt → **if (** boolexpr **) then** stmt **else** stmt
assgstmt → **ID =** arithexpr **;**
boolexp → arithexpr boolop arithexpr
boolop → **<** | **>** | **<=** | **>=** | **==**
arithexpr → multexpr arithexprprime
arithexprprime → **+** multexpr arithexprprime | **-** multexpr arithexprprime | ε
multexpr → simpleexpr multexprprime
multexprprime → ***** simpleexpr multexprprime | **/** simpleexpr multexprprime | ε
simpleexpr → **ID** | **INTUM** | **REALNUM** | **(** arithexpr **)**

In this grammar, *program* is the start symbol. You may assume that each token is separated with at least one white space character (for simple reading). **ID**, **INTNUM** and **REALNUM** are token types. **ID** is an identifier (an identifier is a lowercase letter such as `a b c ... )`, **INTNUM** is a positive integer number (starts with a digit and continues with digits). **REALNUM** is a positive real number (**REALNUM** is **INTNUM.INTNUM)** .

Your translation schema should read a program and print the variables of that program together with their values at the end of that program after that program is executed. If the program is incorrect, it should print an error message and quit (there is no need for error handling in this assignment). You should do type checking in your program to do correct operation for arithmetic expressions (whether integer arithmetic or real arithmetic).

For example, if your translation schema reads the following program:

```
int a = 1 ; int b = 2 ;  real c = 3.0 ;
{ a = a + 1 ;
  b = b * a ;
  if ( a < b ) then c = c / 2 ; else c = c / 4 ; }
```

Your translation schema should give the following output:

a: 2
b: 4
c: 1.5

Test your translation schema with correct and incorrect programs.

You should hand-in:

- Your source program (email to the assistant (Rabia Nuray) (rabian@cs.bilkent.edu.tr))
- Some test runs of your program with correct and incorrect programs (email to the assistant)
- Executable of the your program by email and a message indicating how to run your executable on a university machine. (email to the assistant)

DO IT YOURSELF – CHEATING WILL BE PUNISHED