

CS 3323 - Principles of Programming Languages

Assignment 3

The objective of this programming assignment is to build a functional compiler with basic I/O support and arithmetic computations. Instructions are provided below.

First, download the files `grammar.y`, `scanner.yy`, `icode.cc`, `icode.hh`, `syntab.cc`, `syntab.hh`, `inputs-int.tar.gz`, `inputs-float.tar.gz`, `Makefile`, `run-all.sh` and `driver.cc` from the assignment directory space. Then, perform the necessary modifications to `grammar.y` and to `icode.cc` to add support for floating point operations. You should only work on the grammar file (`grammar.y`) and in `icode.cc`.

The assignment is due on **April 18th 2022, 11:59pm**. Both modified files (`grammar.y` and `icode.cc`) must be uploaded by then. Late policy deduction applies.

Perform the following modifications to the compiler source code:

1. (2.5pt) In `grammar.y`, complete the semantic actions corresponding to the floating point arithmetic binary operations of the non-terminals `a_expr` and `a_term`: (`OP_FADD`, `OP_FSUB`, `OP_FMUL` and `OP_FDIV`). You should query the **datatype** field of a temporary symbol to determine the correct operation to be generated.
2. (1.0pt) In `icode.cc`, function **run**, implement the run-time actions for the floating point arithmetic binary operations `OP_FADD`, `OP_FSUB`, `OP_FMUL` and `OP_FDIV`. These four operations are specific to the datatype `DTYPE_FLOAT`.
3. (1.0pt) In `icode.cc`, function **run**, complete the run-time action of the floating point arithmetic unary operation `OP_UMIN` for the `DTYPE_FLOAT` datatype (**float**). The current implementation only supports `DTYPE_INT` (a C/C++ int).
4. (1.0pt) In `icode.cc`, function **run**, complete the run-time action of the operation `OP_STORE` for the datatype `DTYPE_FLOAT`. It should be very similar to the `DTYPE_INT` case.
5. (1.0pt) In `icode.cc`, function **run**, complete the run-time action of the operation `OP_LOAD` for the datatype `DTYPE_FLOAT`. It should be very similar to the `DTYPE_INT` case.
6. (1.0pt) In `icode.cc`, function **run**, complete the run-time action of the operation `OP_LOAD_CST` for the datatype `DTYPE_FLOAT`. It should be very similar to the `DTYPE_INT` case.

A number of test cases are provided, both for the **int** (directory **inputs-int**) and **float** (directory **inputs-float**) language datatypes. The current implementation of the provided compiler works with all the test cases of the directory **inputs-int**. You can test your progress with the files in **inputs-float**. Note that the output should be practically identical to the corresponding **int** test case.

For convenience, a Makefile is also provided, but you are not required to use it. The Makefile will build two binaries, **simple.exe** and **simple-debug.exe**. The latter will output the symbol table, instruction table and a number of debug prints. Grading will be performed with **simple.exe**. If you need to add debug printing information, always enclose it between `"#ifdef SMP_DEBUG"` and `"#endif"`.

To test a single input file, run: `./simple.exe < inputfile.smp`

You can also test **all** the test cases of a single directory with the script **run-all.sh**. It expects the directory name to test.

Several online resources can be found in the web, for instance:

- <https://www.gnu.org/software/bison/manual>
- <https://www.lysator.liu.se/c/ANSI-C-grammar-y.html#multiplicative-expression>

More resources can be found by searching for the key terms: yacc/bison parser generator.

Do not change any other file. Do not print anything to the output outside of the conditional compilation directives.

Every student should **upload the two modified files in a directory named: ABCDEFGHI**, where ABCDEFGHI is the 9-digit code identifying the student (not the 4+4). You should only upload the files `grammar.y` and `icode.cc`.