CS 3432 Spring 2023

Shirley Moore, Instructor

Lab 1b 50 points

**Expression Compiler Backend for RISC-V: Part b**

For part b, we will finish the backend by adding code that generates correct assembly code for expressions that contain constants. We will also implement strength reduction for multiplication by powers of 2 by changing the multiplication to a shift operation.

You are given a sample input file input1b.txt and the expected output output1b.txt.

Please carry out the following tasks:

1. (20 pts) Add code to the generate\_code() function to handle expressions that contain constants. For binary operations, the code you are given handles the case where both the left and right child of the operator node and REG type nodes. You will need to handle the following additional cases:

* left child is REG type and right child is CONST type
* left child is CONST type and right child is REG type
* left child is CONST type and right child is CONST type

For unary operations, the code you wrote for part a handles the case where the operand of a unary operator is a REG type node. You will need to add code that handles the case where the operand is a CONST type node.

1. (10 pts) If you haven’t already done so for task1, write code to handle immediate values that are larger than 12 bits.
2. (10 pts) Implement strength reduction for multiplication by a power of 2 by replacing the multiplication with the correct left shift instruction.
3. (5 pts) Add additional test cases to thoroughly test your code and show your testing results.
4. (5 pts) Describe any difficulties or obstacles you ran into in doing this lab and if/how you overcame them. Summarize what you learned from doing this lab.