CSE 440/598, Fall 2014

Project 2

Assigned: October 12

Due date: October 29

Note: There will ne no extensions given and the due date will not change. You should start early. This project is still involved and you should make sure all your data structures function correctly by testing them on serious examples.

**Submission checklist**

* Your code should be submitted in one zip file
* Submitted file name should be lastname1\_lastname2.zip
* Make sure you test your code on stats or general before submitting it
* Code that does not compile will not get any credit
* Documentation is important. Document early and often!

**Project description**

In this project, you are asked to generate three-address code and implement some basic optimizations.

The input to your 3-address code generator and optimizer is a semantically correct program, so you do not have to worry about most of semantic errors of project 1 in this project.

You program will contain **only one class that contains only one method.** The method will have declarations for integer variables and no other kinds of variables are declared. The body of the method contains assignments statements, if statements, and while statements.

Expressions in assignment statements can be complex (a+b\*c-d\*(a+b) for example), but there are no Boolean expressions.

**For programs**

1. 3-address code generation. In 3-address code, all if-else and while statements are transformed to conditional branches on single variables that hold the values of the expressions being branched on. I already gave examples of this in class.
2. You should identify basic blocks. The basic blocks should be maximal with no possibility of merging blocks and no empty blocks (dummy blocks).
3. You should identify extended basic blocks as defined in the class
4. Build a control flow graph.

**For basic blocks, you should do**

1. evaluation of constant expressions
2. elimination of redundant expressions using value numbering including
   1. handling commutative operands
   2. constant folding

**For extended basic blocks, you should do**

1. Extended Value Numbering

**For Control Flow Graph, you should do**

1. Global redundancy elimination. I will cover this in class as I have not covered it yet.

**Extra**

1. Add a goto and label constructs for the language

You should definitely do 1-7 for this project. Graduate students are expected to do 8.

**Output**

The output of your program should have multiple sections:

1. A list of all variables including all temporary variables produced followed by the body of the method (there is only one) in 3-address code. Note that you should not have if-else or while in your generated code.
2. A list of basic blocks and for each block its parents and children blocks
3. Same as 1 with value numbering
4. Same as 1 with extended value numbering
5. Same as 1 with global redundancy elimination
6. If you support goto statements in the source code, you do not need to output a separate section for that.