CSE 231 Spring 1998

Project, Part 3 Due Tues Jun 9

This aim of this part of the project is to perform an optimization on SSA form constructed in Part 2, to generate the resulting Simple SUIF program, and to compare the performance of the two versions.

- **Optimization Choice**: You may choose to implement either the Global Value Numbering or Conditional Constant Propagation algorithms for SSA, as covered in the book.
  - **Constant Propagation** You should propagate integer and Boolean constants and do constant folding on SSA form, as well as eliminate unreachable code from resolved branches. You should make sure your constant folding is compatible with your target architecture.
  - **Global Value Numbering** You should perform value numbering on variables and expressions. This involves generating the value graphs, performing partitioning, checking equivalence, and then generating code to hold the values found in temporaries for later reuse. You do not have to take control structure like `if-then-else` and simple loops into account.
- **Simple SUIF Output**: After the optimization, you should generate the Simple SUIF instructions that result. You must get rid of Phi functions in order to generate code. This can be done by generating register copies for each incoming Phi edge for each Phi function, and keeping all the names generated by SSA. You can then rely on register allocation to color your SSA names and get a reasonable register allocation, or do coloring yourself to try to recover most of the original variables.
- **Performance Results**: After generating C code from your before and after versions, you should compare their execution times on some sample programs. You should hand in at least one sample program, and write a short explanation of your performance results. In order to formulate an explanation, you should consult the assembly code of the two versions.

Specification of Output: Your program should output for each procedure

1. The Simple SUIF instruction stream resulting from your optimization, with Phi functions removed.
2. **Global Value Numbering**: You should output the list of partitions with more than one entry, where each partition is a list of variables or symbol table names.

3. **Constant Propagation**: You should output the list of name-constant pairs that result, where names may be variables or symbol table entries.

Submission Procedure: Check the web page for instructions on submitting your project.