CSE 231 Spring 1998

Project, Part 1 Due Thurs Apr 21

This aim of this part of the project is to construct the Control Flow Graph of a Simple SUIF program, and to find the dominators and the natural loops in the produced CFG. For information about getting started with Simple SUIF, see the class web page.

- **Control Flow Graph**: Your program should find the basic blocks and construct the edges between them. You should eliminate any unreachable basic blocks in this step.
- **Dominator Tree**: Given the CFG with unreachable code eliminated, your program should then construct the dominator tree.
- **Natural Loops**: Given the dominator tree, your program should then construct the natural loops for each back edge.

Specification of Output: We first give some rules for output of basic objects.

- A pair and a triple are ordered lists. Otherwise, lists may be output in any given order (i.e., lists are sets).
- Each instruction should be given a number starting from 1 in the order of its occurrence in the Simple SUIF instruction stream.
- A basic block name should be output as a string defined as the string-concatenation of file name, subroutine name, Simple SUIF label. (The first block has no Simple SUIF label, so you should give it the label "Start". The extra Entry and Exit nodes should be given the labels "Entry" and "Exit", respectively.)
- An edge specification should be output as a pair of basic block names which are the source and the target of the edge. Ex. (B1 B2) for the edge from the basic block with name B1 to the basic block with name B2.

Your program should output

1. The CFG. A basic block description should be output as a triple, whose first element is the basic block name, whose second element is a list of instruction numbers which are the contents of the basic block, and whose third element is the list of successor basic block names. (Ex1. (Entry () (B1)), Ex2. (B10 (3 5 7) (B11 B12)) . You should output a list of basic block descriptions in the program. Notice, this defines the CFG.
2. The dominator tree. Any subtree in the dominator tree can be described by a list (Root childlist) where Root is the basic block name of the root of the subtree, and childlist is a list of the subtrees rooted at each child. You should output the dominator tree, using this recursive specification.

3. The natural loops. Each natural loop is described by a pair, whose first element is the edge specification for the back edge, and whose second element is a list of the basic block names in the natural loop. You should output a list of the natural loop descriptions.

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