

CS 415 Compilers: Problem Set 3

Due date: Thursday, February 22 , before recitation

Problem - local register allocation

EAC page 773, Section 13.3, problem 1

In lecture, we talked about top-down and bottom-up local register allocation/assignment. The top-down algorithm discussed in class is different from the one described in the book (p.625). The top-down algorithm in the book ranks virtual registers according to their occurrences in the basic block, and then assigns the top $k - F$ values to the $k - F$ registers that are available for register allocation and assignment. The algorithm discussed in class improves the quality of the code by considering life ranges. Here, the same physical register may be assigned to two life ranges if the life ranges do not overlap.

1. For subproblem a. (top-down algorithm), assume the four physical registers $r_0, r_1, r_2,$ and r_3 . Choose as the set of feasible registers $\{r_2, r_3\}$. Give the resulting code for the simple top-down algorithm (as discussed in the book) and the improved top-down algorithm (as discussed in class).
2. For subproblem b. (bottom-up algorithm), also assume the four physical registers $r_0, r_1, r_2,$ and r_3 .

Note: You have to use only **valid ILOC instructions** for the spill code.