Exercise 7.1  A different instruction set architecture

We consider a different instruction set which evaluates boolean expressions on the stack, similar to arithmetic expressions:

- The boolean value False is represented by the number 0, the boolean value True is represented by any number not equal to 0.
- For every boolean operation exists a corresponding instruction which, similar to arithmetic instructions, operates on values on top of the stack.
- The new instruction set introduces a conditional jump which pops the top-most element from the stack and jumps over a given amount of instructions, if the popped value corresponds to False, and otherwise goes to the next instruction.

Modify the theory Compiler by defining a suitable set of instructions, by adapting the execution model and the compiler and by updating the correctness proof.

Homework 7  Compiler optimization

Submission until Wednesday, December 15, 2010, 12:00 (noon).

A common programming idiom is IF b THEN c, i.e., the else-branch consists of a single SKIP command.

(a) Look at how the program IF Less (V 7) (N 5) THEN 4 ::= N 3 ELSE SKIP is compiled by ccomp and identify a possible compiler optimization.

(b) Implement an optimized compiler (by modifying ccomp) which reduces the number of instructions for programs of the form IF b THEN c.

(c) Extend the proof of comp_correct to your modified compiler.