Compiler Construction WS09/10
Exercise Sheet 10

Please hand in the solutions to the theoretical exercises until the beginning of the lecture next Wednesday 2010-02-03, 10:00. Please write the number of your tutorial group or the name of your tutor on the first sheet of your solution. Solutions submitted later will not be accepted.

Exercise 10.1: Interference Graphs (Points: 2+3)

Consider the following code snippet.

\[
\begin{align*}
    s1 &= 47; \\
    s2 &= 42; \\
    s3 &= s1 + s2; \\
    \text{do } & \{ \\
        s3 &= s3 - s1; \\
        s4 &= s3 + 2; \\
    \} \text{ while } (s3 > s2); \\
    s5 &= s2 \times s4; \\
    s6 &= s3 / s2; \\
    \text{write } s6 - s5;
\end{align*}
\]

1. Draw the interference graph.
2. Assign actual registers to the symbolic registers by coloring the interference graph using Chaitin’s local-colorability criterion and give the resulting code. Use the minimal number of registers.

Exercise 10.2: PBQP (Bonus points: 4)

Show that finding a valid solution of a PBQP is in general NP-hard.
Hint: Reduction from graph coloring.

Exercise 10.3: Register Swapping (Bonus points: 2)

Consider slide 32 on the permutation of register contents. Show that a transposition (swap) can be implemented using addition and subtraction without using an auxiliary register.

Exercise 10.4: Colorability (Bonus points: 6)

Show that Chaitin’s algorithm finds a \( k \)-coloring for every \( k \)-colorable chordal graph.
Hint: Every chordal graph with at least 2 nodes has 2 simplicial nodes.

Exercise 10.5: More on Dominance (Bonus points: 5)

Give an efficient algorithm for checking dominance between basic blocks. Your algorithm may use a linear time precomputation and then has to decide in constant time whether a node dominates another.
Exercise 10.6: Backend (Project)

The last step of your project is to connect to the Firm backend as explained in the tutorials. The slides used in the tutorials are available on the lecture’s web page.

The final deadline for your project is

Thursday, 2010-02-25, 23:59

Solutions submitted later will not be accepted! Send your solution to the practical exercise to jherter@cs.uni-sb.de. Please send just one e-mail per project group.