SAARLAND
UNIVERSITY
COMPUTER SCIENCE

Prof. Dr. Reinhard Wilhelm
Jun.-Prof. Dr. Sebastian Hack
Jörg Herter, M.Sc.
Dipl.-Inform. Christoph Mallon

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.

```
s1 = 47;
s2 = 42;
s3 = s1 + s2;
do {
  s3 = s3 - s1;
  s4 = s3 + 2;
} while (s3 > s2);
s5 = s2 * s4;
s6 = s3 / s2;
write s6 - s5;
```

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.