Lecture: Program analysis
Exercise 1
http://proglang.informatik.uni-freiburg.de/teaching/programanalysis/2010ss/

1 Data flow analysis: Reaching definitions

Consider the following program written in the WHILE language:

```
x := 1;
y := 1;
r := x;
while (n > 2) do (
    r := x + y;
    x := y;
    y := r;
    n := n - 1
)
```

1. For an input `n`, what does the program calculate in `r`?
2. Specify the data flow equations for the program, i.e. for each program point i specify $\mathbf{RD}_\circ(i)$ and $\mathbf{RD}_\bullet(i)$ as on the slides (p. 27 ff.).
3. Calculate the aching definitions analysis for the program. You can check your solution with the PAG online tool (http://pag.cs.uni-sb.de/).

2 Constraint based analysis: Control flow analysis

Consider the following program written in a functional language:

$$[[\texttt{fn}\ z \Rightarrow [z]^1]^2 \quad [\texttt{fn}\ y \Rightarrow [y]^3]^4\ ]^5$$

1. What is the result of evaluating this expression?
2. Specify a constraint system for the program, i.e. for each label l specify $C(l)$, and for each variable x, specify $R(x)$ as on the slides (p. 45 ff.).
3. Can you give a solution for the constraint system? Is it a least solution?

Submission

- No submission for this "warm-up" exercise sheet.
- You might want to read up in Chapter 1 of *Principles of Program Analysis*.