Exercise 1

Consider the following program:

Input: $z, n$. Output: $(z + 1) \times n$.

\[
\text{result} := 0; \\
\text{while } [n > 0] \text{ do} \\
\quad \text{if } [n > 1] \text{ then} \\
\quad\quad [x := z + 1]; \\
\quad\quad [\text{result} := \text{result} + x]; \\
\quad\quad [n := n - 1]; \\
\quad\text{else} \\
\quad\quad [x := z + 1]; \\
\quad\quad [\text{result} := \text{result} + (x \ll 1)]; \\
\quad\quad [n := n - 2]; \\
\quad\text{fi} \\
\text{od};
\]

1. Perform an Available Expressions analysis for this program (cf. Nielson&Nielson, chap. 2.1.1.), i.e. define the gen and kill sets and the data flow equations, and find a least solution.

2. In a similar way, perform a Very Busy Expression analysis (cf. Nielson&Nielson, chap. 2.1.3.).

3. Transform the program such that it avoids unnecessary re-calculations of expressions.

Submission

- Deadline: 01.06.2010, 11:00, per mail to bieniusa@informatik.uni-freiburg.de, or on paper to Annette Bieniusa, Geb. 079, Room 000-14.

- Late submissions will not be marked.

- Do not forget to put your name on the exercise sheet.

- You might want to read up in Chapter 2.1 of Principles of Program Analysis.