Technische Universität München
Fakultät für Informatik
Prof. Dr. H. Seidl

Dr. K. N. Verma
verma@in.tum.de
Room: MI 02.07.041

Program Optimisation

Winter Semester 2004

3. Homework *Deadline: 16 Nov 2004 12:00*

Exercise 1: *6 Points*

Define a program analysis which directly computes the set of dead variables for each program point.

a) Define the associated lattice.
b) Define the associated edge-transformation.
c) Extend the analysis to a "real deadness" analysis.

How can the correctness of the analysis be shown?

Exercise 2: *4 Points*

Let $f_1, f_2 : \mathbb{D} \to \mathbb{D}$ be two distributve functions. Show that

a) $f_1 \circ f_2$ is distributive.
b) $f_1 \sqcup f_2$ is distributive.

Exercise 3: *6 Points*

Apply the three optimisations of the lecture on the example program `swap`. Is the result now satisfactory?

Exercise 4: *6 Points*

Let $\mathbb{V}_1 = \{V \in \mathbb{V} \mid e \neq e' \Rightarrow (Ve) \cap (Ve') = \emptyset\} \cup \{V_\top\}$ where $V_\top e = Vars$ for all $e \in Expr$, with $\mathbb{V}, Vars, Expr$ as in the lecture.

a) Show that the analysis for eliminating redundant moves in reality works with $\mathbb{V}_1$ instead of $\mathbb{V}$.
b) Show that the longest strictly increasing chain in $\mathbb{V}_1$ has length $|Vars| + 1$, independent of the number of expressions e.