Assignment 2

1. Intra Procedural Copy Analysis

The aim of Copy Analysis is to determine for each program point ℓ', which copy statements $[x := y]^\ell$ that still are relevant (i.e. neither x nor y have been redefined) when control reaches point ℓ'.

Specify the Copy Analysis

a) Define $\text{kill}_{\text{CA}}(\ell)$ and $\text{gen}_{\text{CA}}(\ell)$ to be the sets of copy statements killed resp. generated by the elementary statement B^ℓ.

b) Define the equations for $\text{CA}_\circ(\ell), \text{CA}_\bullet(\ell) : \text{Lab}_\star \to \mathcal{P}(\text{Var}_\star \times \text{Var}_\star)$

2. Precise Intra Procedural Copy Analysis with PAG

Refinements:

- test whether (x, y) is in the analysis information when given $y := x$ and do not invalidate (x, y).
- test for cases $x_2 := x_1; \ldots; x_n := x_{n-1};\ z := x_n$; such that z is a copy of all x_i $(1 \leq i \leq n)$. (similarly for all x_i).
- handle cases $x := x$ such that no information is killed and they are not represented in the analysis information

Example:
$[\text{a := b}]^1$; if $[\text{x > b}]^2$ then $([\text{y := a}]^3)$ else $([\text{b := b + 1}]^4; [\text{y := a}]^5)$; $[\text{skip}]^6$

ℓ	$\text{CA}_\circ(\ell)$	$\text{CA}_\bullet(\ell)$
1	$\emptyset$	{(a,b)}
2	{(a,b)}	{(a,b)}
3	{(a,b)}	{(y,b),(y,a),(a,b)}
4	{(a,b)}	$\emptyset$
5	$\emptyset$	{(y,a)}
6	{(y,a)}	{(y,a)}

Specify the Precise Copy Analysis for the language SL_1 with PAG (see SL_1 specification for details) and create an analyzer 'ca' that takes as input an SL_1 program and generates as output a gdl file, describing the CFG and the analysis result for each program point, named 'ca_result.gdl'.

3. Hand in

- Send your answers for questions 1a, 1b, and the PAG specification for 2 per e-mail to `markus@complang.tuwien.ac.at`
- The e-mail must have as subject "OPTUB:Assignment 2, <LastName>" where <LastName> is replaced with your last name. The PAG specification should be attached as tgz file containing all required files for creating analyzer. The answers should be provided as text in the email body or alternatively as attached postscript or pdf files.
- Deadline: 2pm November 7, 2007.