

Software Quality Assurance (WS16/17)

Problem Set 6

Due: in exercise, 25.01.2017

Problem 1: Data Flow Anomaly Analysis

A software company develops software packages for commercial animal housing. A particular function, which is implemented in the C programming language, computes the daily amount of feed for different animal species depending on their individual weight.

Until now, this function was only part of a software package for farms and worked failure-free since years. Recently, it is also included in a software package for zoological gardens and it produces wrong output in some cases. By performing a data flow analysis, the faults should be revealed.

```
/* Own data type for enumeration of animal species */
typedef enum {COW, HORSE, PIG, ELEPHANT} Animal_A;

/* Function for determining the daily amount of feed depending
 * on the animal species and the individual weight
 */
01 float feedamount(Animal_A species, float weight)
02 {
03     float amount, factor;
04     switch (species)
05     {
06         case COW:
07             {
08                 factor = 0.05;
09                 break;
10             }
11         case HORSE:
12             {
13                 factor = 0.1;
14                 break;
15             }
16         case PIG:
17             {
18                 factor = 0.02;
19                 break;
20             }
21     } // end switch
22     amount = factor * weight;
23     return amount;
24 } // end feedamount
```

- What mistakes were performed and how would the consequences have been avoided?
- Perform a data flow anomaly analysis for the operation `feedamount`.

Problem 2: Data Flow Anomaly Analysis

Consider the following Java implementation of the operation ALL_POSITIVE which checks whether all elements of a one-dimensional array are positive. As parameters, the field and its length are given.

```
01 boolean ALL_POSITIVE(int[] array,int len) {
02     boolean result;
03     int i,tmp;
04     i=0;
05     result=true;
06     while (i<len&&result) {
07         tmp=array[i];
08         if (tmp<=0)
09             result=false;
10         i++;
11     }
12     return result;
13 }
```

Perform a data flow anomaly analysis for the operation ALL_POSITIVE.

Problem 3: Slicing

Create static backward slices for the last occurrence of variables result, mode and this.mode.

```
01 public class Switch {
02     private boolean mode;
03     public Switch() {
04         init();
05     }
06     private void init() {
07         mode=true;
08     }
09     public boolean toggle(boolean mode) {
10         boolean result;
11         if((this.mode&&mode)||(!this.mode&&!mode))
12             result=true;
13         else
14             result=false;
15         if (this.mode)
16             this.mode=!mode;
17         else
18             mode=mode;
19         return result;
20     }
21 }
```