
Software Engineering

<http://proglang.informatik.uni-freiburg.de/teaching/swt/2014/>

Exercise Sheet 8

Exercise 1: DART (15 Points)

Recall the DART^{1 2} technique from the lecture and consider the following program:

```
1 int maxOf3(int x, int y, int z) {
2     int m;
3     if (x > y)
4         if (x > z)
5             m = x;
6         else
7             m = z;
8     else if (y > z)
9         m = y;
10    else
11        m = x;
12    return m;
13 }
```

i. Apply *DART* on method `maxOf3`.

Compute a set of tuples of input values (x, y, z) that covers all paths of `maxOf3`. Each tuple (x, y, z) is a test case which covers one path of `maxOf3`. Provide the concrete execution, the symbolic execution and the path constraints.

- ii. Additionally generate test cases to ensure all possible combinations of relationships between x, y and z are covered. I.e., $x < y, x = y, x > y, y < z, y = z, y > z, \dots$
- iii. For each generated test case, determine *your* expected return value of `maxOf3` (i.e. the test oracle is you). Is method `maxOf3` faulty? If so, name the test case generated in i, that reveals the bug, if possible.
- iv. Which kind of coverage is achieved by DART. what is your opinion of coverage criteria, in general? Is it guaranteed for *DART* to reveal the bug in this particular example? Justify your answer.
- v. Consider extending DART to programs with loops and function calls. which problems do you expect? How would you deal with impure functions that return different results for the same parameters (for example, a random number function or a function returning the current time)?

¹Paper: http://research.microsoft.com/en-us/um/people/pg/public_psfiles/pldi2005.pdf

²Talk: http://research.microsoft.com/en-us/um/people/pg/public_psfiles/talk-pldi2005.pdf

Exercise 2: Random Testing (5 Points)

Consider a (black box) function “`boolean leapYear(int year)`” that returns `true` iff the year input is a leap year³.

- How would you set up random testing for this function?
 - Assuming that the function’s implementation just contains a single return statement without function calls, give a minimum set of test cases to validate this implementation.
-

Submission

- Submit this sheet *before* the lecture of Thursdays.
- Late submissions will not be accepted.
- Deadline: Thursday 11:59 a.m.

³http://en.wikipedia.org/wiki/Leap_year