Universität des Saarlandes
Fachrichtung 6.2 – Informatik
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Seventh Assignment: Software Visualization (WS 02/03)

For this exercise you have to perform the following program by paper and pencil for several test cases. For each program point p and each test case q you have to count the number of times p is executed during failing runs $f_{p,q}$ and successful runs $s_{p,q}$. In addition we are interested in whether a program point was executed at all during a failing run, i.e. $F_{p,q} = 1$ iff $f_{p,q} > 0$ otherwise $F_{p,q} = 0$. Analogously for successful runs we define $S_{p,q} = 1$ iff $s_{p,q} > 0$ otherwise $S_{p,q} = 0$.

```
p |  program points                q |  test cases
--+----------------               --+-------------
1 |  running=true;                 1 |  x=1 , y=0
2 |  while (x>0)                   2 |  x=2 , y=2
3 |     if (x%y==0)                3 |  x=3 , y=2
4 |        x=x-1;                  4 |  x=3 , y=1
  |       else                     5 |  x=3 , y=3
5 |        y=y-2;                  6 |  x=5 , y=3
6 |  running=false;                7 |  x=5 , y=4
```

Note that `%` represents the modulo operator in Java and that it throws division-by-zero exceptions.

Exercise 1: (4 points)

Compute the numbers $f_p = \sum f_{p,q}$, $s_p = \sum s_{p,q}$, $F_p = \sum F_{p,q}$ and $S_p = \sum S_{p,q}$. Now there are different relations for each program point that you are going to represent: $\frac{f_p}{s_p}$,$\frac{f_p}{f_p+s_p}$, $\frac{F_p}{S_p}$,$\frac{F_p}{F_p+S_p}$. Instead of using color coding draw for each of these relations a 3×2 matrix M such that the entry $M_{i,j}$ shows the value of the relation for program point $(i-1) * 3 + j$.

Exercise 2: (4 points)

For each of the relations suggest a way of using colors and possibly other means such that not only the value in each matrix entry is visualized but also its support. A simple color coding scheme $\sigma : \mathcal{R} \rightarrow C$ would map the values to a color space, e.g. $C = \{red, orange, yellow, green, blue\}$ and we would color the matrix entry of p with $\sigma(\frac{f_p}{s_p})$. How can you in addition to the value in each matrix element also visualize its support or evidence, i.e. $f_p = 5$ and $s_p = 20$ has more support than $f_p = 1$ and $s_p = 4$, although $5/20$ is equal to $1/4$.

Exercise 3: (4 points)

For the relation $\frac{f_p}{f_p+s_p}$ draw three bar charts that differ in the way bars are colored, placed, sized, overlap, etc. Try to come up with designs that highlight program points that are very likely to cause the error.

Please, hand in your assignment at the start of the lecture on January 29th.