Research Institute for Discrete Mathematics
Chip Design
Summer Term 2014

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Programming Exercise 2

Implement an algorithm which computes a rectangular chip image of minimum area in which a feasible placement exists for a given set of n rectangles (without rotations). The theoretical running time must be $\mathcal{O}((n!)^2 \cdot n \log n)$. You should achieve this by using sequence pairs.

The source code must be written in C or C++ and compile with GCC on Linux. It should be well documented [1]. You are allowed to use standard headers including the STL, but no other external libraries. The program call must be

PROGRAM <INPUTFILE> <OUTPUTFILE>

Input: The first line contains a number $n \in \mathbb{N}$ specifying the number of rectangles to be placed. The remaining n lines contain two numbers specifying the widths and heights of the rectangles, which will be integers contained in the interval $[1, 2^{31} - 1]$.

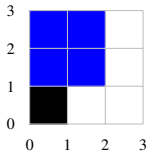
Example:
An instance with two squares with edge length 1 and 2 would be encoded as follows:

```
2
1 1
2 2
```

Output: The output must consist of $n + 1$ lines, where the first line consists of two integers specifying width and height of the computed chip area. The remaining n lines must encode integral positions of the lower left corners of the rectangles, i.e. the $i + 1$st line consists of two integers specifying x- and y- coordinate of the lower left corner of the rectangle corresponding to the $i + 1$st line of the input file ($i = 1, \ldots, n$). The lower left corner of the chip image is always assumed to be 0.

Example:
The plotted solution for the example instance can be encoded as follows:

```
2 3
0 0
0 1
```



[1] This can be achieved by using comments and – much more importantly – self-documenting code.

Test instances will be provided on the website of the exercise class

http://www.or.uni-bonn.de/lectures/ss14/chipss14_ex.html.

The complete source code must be sent to *scheifele@or.uni-bonn.de* until

Tuesday, June 24, 00:00h.

(32 points)

In case of any questions feel free to contact me at scheifele@or.uni-bonn.de .