Research Institute for Discrete Mathematics
Chip Design
Summer term 2013

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Exercise Set 6

Exercise 6.1:
Given rectangles $C_1, \dots, C_n$ with widths $w_1, \dots, w_n$ and heights $h_1, \dots, h_n$. Formulate an integer linear program that checks whether they can be packed (without overlaps) within a rectangle $[x_{\min}, x_{\max}] \times [y_{\min}, y_{\max}]$ allowing rotations by multiples of $90°$.

(4 points)

Exercise 6.2:
Prove that the Standard Placement Problem can be solved optimally in

$$\mathcal{O}\Big(\big((n+s)!/s!\big)^2 (n+k)(m+n^2+k\log k)\log(n+k)\Big)$$

time, where $n = |\mathcal{C}|, s = |\mathcal{S}|, k = |\mathcal{N}|$ and $m = |P|$.
Here, $\mathcal{C}$ denotes the set of circuits, $\mathcal{S}$ the set of blockages, $\mathcal{N}$ the set of nets and P the set of pins.

(4 points)

Exercise 6.3:
Given $d \in \mathbb{R}_{>0}$ and rectangles $C_1, \dots, C_n$ with widths $w_1, \dots, w_n \geq d$ and height 1. Left and right border of each rectangle is colored such that both borders of the same rectangle have different colors.
We want to place the rectangles in one row without overlaps but allowing reflection such that the distance between borders with different colors is at least d.

Give an algorithm with running-time $\mathcal{O}(n)$ which finds such a feasible placement minimizing the used horizontal space.

(8 points)

Deadline: Thursday, June 13th, before the lecture.