Chip Design
SS 2008

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Exercise 6

1. Consider following specialized legalization problem. A feasible placement consists of integral placement coordinates $x, y : \mathcal{C} \to \mathbb{Z}$ (such that all circuits are located within the chip image), and all circuits have unit height and width: $\mathcal{D}(B) = \{([0,1] \times [0,1] \times \{0\})\}$ for all $B \in \mathcal{B}$. Find a polynomial time algorithm that, based on an input placement with overlaps, finds a legal placement minimizing the linear or quadratic movement. (6 points)

2. Consider the problem of checking the feasibility of a routing within a single layer z. Two wire shapes of different nets must respect a minimum distance $\rho^1_{z,z}$ from each other. To simplify the problem, the number of shapes per net is bounded by a constant. Show that the feasibility can be checked in $O(n \log n)$, where n is the total number of wire shapes in the layer. (6 points)

3. Implement the Single Row Algorithm from Chapter 10

   (a) minimizing the total quadratic movement, and (6 points)

   (b) minimizing the total linear movement. (6 points)

   The implementation must respect the same programming guidelines as in Exercise 3.3.

   The input should be read either from an input pipe or from a file. The data is given as a set of lines. The first line defines the outline of the zone by providing the numbers $x_{\min}, x_{\max}$. Each of the following lines defines a circuit by its x-coordinate and width. The x-coordinates refers to the left edge of a circuit.

   The output should consists of a line specifying the total movement and a line for each circuit specifying the new placement x-coordinate. The circuits must be given in the same order as in the input.

   Instances can be found on the web page for the exercise.

   `http://www.or.uni-bonn.de/~held/vlsi_design_ss08/Chip_Design_Exercises.html`

The deadline for problems 1. and 2. is **Tuesday June 3 at 12:15**, before the lecture.

The deadline for problem 3. (programming exercise) is **Tuesday June 10 at 12:15**, before the lecture.