National Yang Ming Chiao Tung University

電子研究所 / 前瞻半導體研究所

Physical Design Autmation, Fall 2023

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Programming Assignment #2

Chip Floorplanning

Due: November 17, 2023

1   Problem Description

Let $B = \{b_1, b_2, b_3, ..., b_n\}$ be a set of n rectangular hard IP blocks, and $N = \{n_1, n_2, n_3, ..., n_m\}$ be a set of m nets. Each net n_i connects a subset of the blocks in B. The chip floorplanning problem is to place all blocks within a rectangular chip without any overlaps such that the area of chip bounding box, A, and the wirelength of all nets, WL, are minimized. We assume that the lower-left corner of this chip is at the origin (0,0) and no space (channel) is needed between two blocks. The width and height of the resulting chip bounding box are denoted by W and H, respectively.

To further simply the problem, the objective of this assignment is only to minimize A under the aspect ratio, R, constraint, where $A = W \times H$ and $R = W/H$, and $R_{lowerbound} \le R \le R_{upperbound}$.

2   Input

The input format and a sample input are given as follows:

Input Format	Sample Input
$< R_{lowerbound} > < R_{upperbound} >$	0.5 2.0
<Block Name> <Block Width> <Block Height>	b1 40 50
⋮	b2 60 50
	b3 60 50
	b4 40 50

The input file starts with the lower bound and upper bound of the aspect ration constraint, followed by the description of n blocks. The description of each block contains the block name, followed by the width and height of the block. See the sample input for the format of a circuit with four blocks.

3 Output

In the program output, you are asked to give the overall chip area and the aspect ratio of the resulting floorplan, and the bottom-left coordinate of each block. The following table gives the output format and an output to the sample input.

Output Format	Sample Output
A = \<chip area\>	A = 100
R = \<aspect ratio\>	R = 1.0
\<Block Name\> \<x\> \<y\>	b1 0 50
⋮	b2 40 50
	b3 0 0
	b4 60 0

4 Language/Platform

1. Language: C or C++ is preferred.

2. Platform: Linux.

5 Command-line Parameter

In order to test your program, you are asked to add the following command-line parameters to your program (e.g., Floorplan input.dat output.dat):

[executable file name] [input file name] [output file name]

6 Submission

You need to submit a tar file, which includes (1) source codes, (2) Makefile, (3) a text readme file (readme.txt) stating how to build and use your program, to E3 (`https://e3.nycu.edu.tw/`) by the deadline. Please put all required files in a folder, and use the following command to compress the folder in the linux environment.

tar cvf Student_ID.tar Student_ID

The folder name and the compressed file name must be your student ID.

7   Grading Policy

This programming assignment will be graded based on (1) the **correctness**, (2) **solution quality**, and (3) **running time**. For each test case, it will be regarded as "failed" if your program takes more than 1 hours.

There will be 20% penalty per day for late submission.