National Taiwan University of Science and Technology
Department of Electrical Engineering

Software Development for Electronic Design Automation, Spring 2024

Programming Assignment #2

Soft Block Floorplanning (due May 5, 2024 (Sunday) on-line)

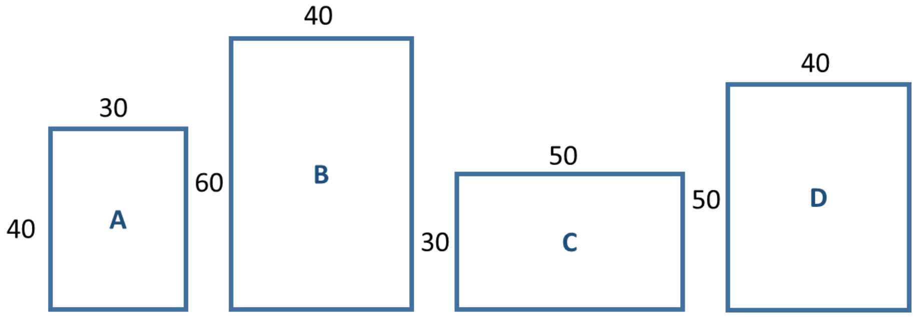
1. Problem Description

This programming assignment asks you to write a chip floorplanner that can handle soft macros. Given a set of rectangle macros, the floorplanner places all macros without any overlaps and makes the overall area as small as possible. The chip aspect ratio should be near 1 as well. We assume that the lower-left corner of this chip is the origin (0,0), and no space (channel) is needed between two macros.

2. Input

Each test case (floorplan_**) gives the number of blocks and the aspect ratio constraint. Then the initial block dimensions are listed. The file format is as follows:

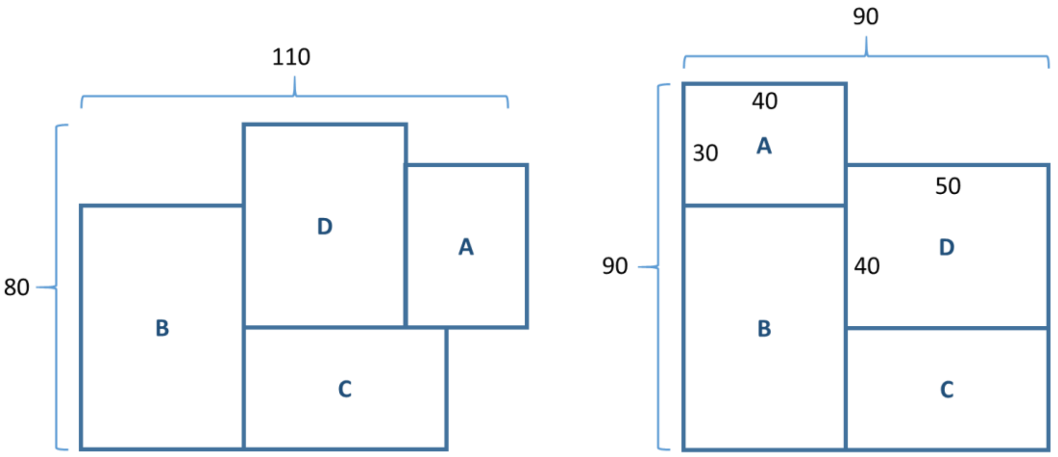
Input Format	Sample Input
NumBlocks <# of blocks>	NumBlocks 4
MinAspectRatio <minimum $\frac{block\ height}{block\ width}$>	MinAspectRatio 0.5
MaxAspectRatio <maximum $\frac{block\ height}{block\ width}$>	MaxAspectRatio 2
	A 30 40
	B 40 60
<macro name> <macro width> <macro height>	C 50 30
… More macros	D 40 50



3. Output

The output file (**.out*) records the problem output, which consists of three parts: (1) the chip width and height, and (2) the bounding-box coordinate for each macro (specified by the lower-left corner and upper-right corner). The output file format is shown below.

Output Format	Sample Output
<chip_width> <chip_height>	80 90
<macro_name> <macro width> <macro height> <x1> <y1> <x2> <y2>	A 40 30 0 60 40 90
// (x1, y1): lower-left corner, (x2, y2): upper-right corner	B 40 60 0 0 40 60
	C 50 30 40 0 80 30
	D 50 40 40 30 80 70



Fix the shapes

Reshape A and D

The left example result above uses the initial block dimensions and the right one resahpes Blocks A and D to get a smaller chip area and a better chip aspect ratio.

4. Language/Platform

(a) Language: C or C++.

(b) Platform: Unix/Linux or Windows.

5. Command-line Parameter

In order to test your program, you are asked to add the following command-line parameters to your program:

```
./floorplanner [input file name] [output file name]
```

6. Submission

You need to submit the following materials in a compressed [student id]-p2.tgz file (e.g., b11007000-p2.tgz) at the course website by the deadline: (1) source codes, (2) Makefile, (3) a text readme file (readme.txt) stating how to build and conduct your program, and (4) **a report (report.docx) no more than 2 pages introducing your data structures and algorithms**. Please carefully read the following instructions:

- The compressed file [student id]-p2.tgz file contains only a single folder named [student id]-p2 (e.g., b11007000-p2). Use only lowercase letters for the compressed file and folder names.
- Only a compressed file in the *.tgz format will be accepted.
- Do not submit files or folders other than those specified above.
- Please ensure that your work can be successfully executed in the Linux environment.

**If the above requirements are not met, penalties will be imposed

7. Grading Policy

This programming assignment will be graded based on (1) the correctness, (2) readme.txt and report, (3) running time no more than 10 minutes, and (4) solution quality evaluated by:

$$chip\ width \times chip\ height \times \frac{\max\,(chip\ width, chip\ height)}{\min\,(chip\ width, chip\ height)}$$

8. Online Resources

Sample input files can be found at the course website.