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Nov. 20, 2019
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Physical Design for Nanometer IC, Winter 2019

Programming Assignment #3 Abacus
(due Dec. 18, 2019 on-line)

1. Problem Statement

Modern state-of-the-art analytic placement typically consists of three stages: global placement, legalization and detailed placement. Global placement determines globally-optimized locations of circuit elements while roughly spreading them. Following the global placement, legalization seeks legal locations of circuit elements and detailed placement locally refines the given locations to further optimize design objectives, such as wire length.

This programming assignment asks you to write a **Legalize placers (please reference Abacus [1])** that can remove overlaps between cells and preserve global placement result (minimize cell movement distance). For a given legal circuit placement of a netlist N, detailed placement performs local refinements and seeks legal locations of the circuit elements, such that the total wire length, placement with minimal impact on density-related metrics.

Note that you don't need to do global placement, so you just need to parse .legal file to get the information of location and refine it.

For more detail information you can visit the CAD contest website [3], but we don't need to consider the constraints about displacement and utilization.

2. Input

- **.net, .nodes, .legal, .scl, .shapes**

  The format of input files are descried in the Benchmark_Descirption.pdf

3. Output

- **.pl**

  The format of output files are descried in the Benchmark_Descirption.pdf

  Note that please check your format by checker to ensure your format is correct

4. Language/Platform

The program should be performed on Linux machine

5. Command Line Format

./LG_StudentID –bench **circuit** –output circuit.pl

Example: ./LG_N26055544 –bench /temp/superblue1 –output /out/superblue1.pl

Note that you should write your own make file.

The input file will not include filename extension, so you shoud add the filename extension which you need to the benchmark when running the program

Ex. /temp/superblue1 + .nodes

However, output file must be .pl, so you do not need to add filename extension.

Ex. /out/superblue1.pl + .pl

6. Grading Strategy

This programming assignment will be graded based on the following terms

- Correctness of the program
- Solution quality
- Running time

7. Hard Constraints

- Legality of results
- Wirelength improve at least 2%
- Runtime can't exceed five minutes

8. Note

- The detail information is in the readme file, please view the file.

9. Reference

[1] Peter Spindler, Ulf Schlichtmann and Frank M. Johannes, "Abacus: Fast Legalization of Standard Cell Circuits with Minimal Movement" ISPD, pp. 47-53, 2008

[2] Sheng Chou and Tsung-Yi Ho, "OAL: An Obstacle-Aware Legalization in Standard Cell Placement with Displacement Minimization", SOC Conference (SOCC-2009), pp, 329-332, 2009.

[3] http://cad-contest.cs.nctu.edu.tw/CAD-contest-at-ICCAD2013/problem_b/

[4] http://www.tu-freiberg.de/urz/anwendungen/sprodukte/soft/LASPACK/laspack.html