National Cheng Kung University Sep. 21, 2023

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VLSI/CAD Group Physical Design for Nanometer IC, Fall 2023

Programming Assignment #1: FM program – [2-way Partition]

Let *C =*{*c1, c2, c3, …, cn*} be a set of *n* cells and *N =* {*n1, n2, n3, …, nm*} be a set of *m* nets. Each net *ni* connects a subset of the cells in *C*. The 2-way partition problem is to partition *n* cells in set *C* into two disjoint groups, *G1* and *G2* such that the overall cut size is minimized. Note that no cell replication is allowed. The “***cut size***” *s* is given by “***the number of nets having cells on both G1 and G2****”*. We define the group size as the area of cells in the group. The partition constraint is that “|***G1***|/(|***G1***|***+***|***G2***|) ***≈ γ* where** |***Gi***| **denote the size of *Gi* and *γ* is equal to 0.4**”.

# Input

* **.nodes file**

|  |  |  |
| --- | --- | --- |
| **Sample Input** | | |
| UCLA nodes 1.0  # Created : Jan 6 2005  # User : Gi-Joon Nam & Mehmet Yildiz at IBM Austin Research({gnam, mcan}@us.ibm.com)  NumNodes : 211447 **→ Total number of cells**  NumTerminals : 543  o0 8 12  o1 13 12  o2 13 12  o3 13 12  o4 13 12  o5 13 12  o6 13 12  o7 13 12 **Cell Name, The width of cell, The height of cell (Sequentially)**  o8 13 12  o9 13 12 | | |
| o211434 80 1020  o211435 164 2136  o211436 164 2136  o211437 164 2136  o211438 164 2136 | terminal terminal terminal terminal  terminal | **[Do NOT need to consider FIXED nodes]** |

**FIXED nodes**

# .nets file

|  |
| --- |
| **Sample Input** |
| UCLA nets 1.0  # Created : Jan 6 2005  # User : Gi-Joon Nam & Mehmet Yildiz at IBM Austin Research({gnam, mcan}@us.ibm.com)  NumNets : 221142 **→ Total number of nets**  NumPins : 944053 **→ Total number of pins**  NetDegree : 4 n0 **→ Net n0 linking 4 cells**  o197239 I : -0.500000 -6.000000  o197110 O : -1.500000 -3.000000  **Cells linked by n0**  o85644 I : -6.000000 -2.000000  o0 I : -3.000000 -5.000000 **Cell Name, Input/Output Pin, OffsetX, OffsetY (Sequentially)**  **[Only need Cell Name]** |

**Output**

The program output asks you to find out the cut size (***as small as possible***), the sizes of *G1* and *G2*, and the cells in *G1* and *G2*. The following table gives the output format. **Please follow the output format to generate output file.**

|  |
| --- |
| **Sample Output** |
| Cut\_size: 4  G1\_size: 3  G2\_size: 3  Time: 0.000 s G1:  o0 o1 o2;  G2:  o4 o5 o6;  Cut\_set:  n1 n2 n3 n5; |

# Language/Platform

The program should be performed on the Linux machine.

Compiler version: g++ 6.3.0

# Command Line Format

FM\_StudentID <circuit.nodes> <circuit.nets> [circuit.out]

Example: ./FM\_XXXXXXXXX adaptec1.nodes adaptec1.nets adaptec1.out

# Note that you should write your own make file.

**Evaluation Score**

The released **five** benchmarks and **one hidden** benchmark will be used to evaluate score.