

## HW4 Report

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- (1) The wirelength and the runtime of each testcase.

ibm01

```
Benchmark: ibm01-cu85
Global HPWL: 653133158   Time:    6.0 sec (0.1 min)
Legal  HPWL: 658173951   Time:    1.0 sec (0.0 min)
Detail HPWL: 310927825   Time:    8.0 sec (0.1 min)
=====
                HPWL: 310927825   Time:   15.0 sec (0.2 min)
```

ibm05

```
Benchmark: ibm05
Global HPWL: 54231669    Time:  127.0 sec (2.1 min)
Legal  HPWL: 54520151    Time:    3.0 sec (0.1 min)
Detail HPWL: 28400674    Time:   32.0 sec (0.5 min)
=====
                HPWL: 28400674    Time:  162.0 sec (2.7 min)
```

ibm09

```
Benchmark: ibm09-cu90
Global HPWL: 5484176293   Time:   29.0 sec (0.5 min)
Legal  HPWL: 5425411754   Time:    7.0 sec (0.1 min)
Detail HPWL: 2620809749   Time:   52.0 sec (0.9 min)
=====
                HPWL: 2620809749   Time:   88.0 sec (1.5 min)
```

- (2) The details of your algorithm. You could use flow chart(s) and/or pseudo code to help elaborate your algorithm. If your method is similar to some previous work/papers, please cite the papers and reveal your difference(s).

用analytical 的方式且使用LSE和 bell shaped的方式去實作. Objective function 跟講義中提的一樣

$$\text{Minimize } \sum_{e \in E} c_e \times \text{WL}_e(\mathbf{x}, \mathbf{y}) + \beta \times \sum_b (D_b(\mathbf{x}, \mathbf{y}) - T_b)^2$$

- (3) What tricks did you do to speed up your program or to enhance your solution quality?  
計算gradient 和 LSE 有用 c++ library openmp 的平行化

- (4) Please compare your results with the previous top 5 students' results and show your advantage either in runtime or in solution quality. Are your results better than theirs?  
都第五名, 這個作業十分不好做到好的結果. 嘗試過不同的bin數和stepsize對結果都會有很大的影響, 這次的做法有用老師在課堂中提到的將objective function 中的beta值慢慢變大.