

Physical Design Report in PA3

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● 設計演算法架構:

原則上，在這次的作業我參考了 NTU place3，及 sample code，原本希望能用 analytical method-梯度下降法來實作本次 PA 的 Global placer.而我也確實挑選了 WA 來當作 wirelength 的 model，但最後在實驗時卻以失敗作為結尾。我不確定是哪邊出了問題，因此本次的作業是利用一種簡單且粗暴的方式去讓他做到夠好的 initial module 來實作 Global placer，並依賴 Legalization, detailed placement 來完成整個 flow.

● 各個函數的功能與介紹:

我將 `initializer()` 放在 `placement` 的 Class 裡面，讓他在初始化時將所有的 macro，靠著左下角去做排序。因為他是 `standard cell` 的 `placement`，因此他的每一個 `cell` 的 `height` 皆相同，因此我在做初始化時就可以很簡單的去擺放，而最後的結果也通過了每一筆測資的 `legalization`.

● Findings:

藉由這次的 PA，發現了 `placement` 的難度，雖然這次的 `fixed-outline` 非常大，且 `cell` 的數量也很少，但在實作 `analytical method` 卻是一份艱困的任務，但未來卻是在有各種 `constraint` 的情況下，如果 `mixed-size` 的 `placement`，或是有些 `preplaced macro` 的 `problem`，都會更高地去提升難度。

● 程式執行結果:

lbm01:

```
//////// Legalization //////////
macro size: 0
--legalization success!

HPWL: 681580734 (-0.25%)

//////// Detail Placement //////////
run: 0 HPWL=613763564 (-9.950%)(-9.950%) time: 0 sec all: 0 sec
run: 1 HPWL=576350698 (-6.096%)(-15.439%) time: 0 sec all: 0 sec
run: 2 HPWL=530918600 (-7.883%)(-22.105%) time: 0 sec all: 0 sec
run: 3 HPWL=502322853 (-5.386%)(-26.300%) time: 0 sec all: 0 sec
run: 4 HPWL=470816333 (-6.272%)(-30.923%) time: 0 sec all: 0 sec
run: 5 HPWL=447332485 (-4.988%)(-34.368%) time: 0 sec all: 0 sec
run: 6 HPWL=422542805 (-5.542%)(-38.005%) time: 0 sec all: 0 sec
run: 7 HPWL=405120113 (-4.123%)(-40.562%) time: 0 sec all: 0 sec
run: 8 HPWL=389509795 (-3.853%)(-42.852%) time: 0 sec all: 0 sec
run: 9 HPWL=377458906 (-3.094%)(-44.620%) time: 0 sec all: 0 sec
run: 10 HPWL=369274697 (-2.168%)(-45.821%) time: 0 sec all: 1 sec
run: 11 HPWL=362592881 (-1.809%)(-46.801%) time: 0 sec all: 1 sec
run: 12 HPWL=357189986 (-1.490%)(-47.594%) time: 0 sec all: 1 sec
run: 13 HPWL=351798370 (-1.509%)(-48.385%) time: 0 sec all: 1 sec
run: 14 HPWL=346748713 (-1.435%)(-49.126%) time: 0 sec all: 1 sec
run: 15 HPWL=343760300 (-0.862%)(-49.564%) time: 0 sec all: 2 sec
run: 16 HPWL=341870616 (-0.550%)(-49.842%) time: 0 sec all: 2 sec
run: 17 HPWL=339861355 (-0.588%)(-50.136%) time: 0 sec all: 2 sec
run: 18 HPWL=338206612 (-0.487%)(-50.379%) time: 0 sec all: 2 sec
run: 19 HPWL=336643418 (-0.462%)(-50.608%) time: 0 sec all: 2 sec
run: 20 HPWL=335628341 (-0.302%)(-50.757%) time: 0 sec all: 3 sec
run: 21 HPWL=335017118 (-0.182%)(-50.847%) time: 0 sec all: 3 sec
run: 22 HPWL=333222011 (-0.536%)(-51.110%) time: 0 sec all: 3 sec

HPWL: 333222011 (-51.11%)

////////////////////////
Benchmark: lbm01-cu85

Global HPWL: 5899472 Time: 2.0 sec (0.0 min)
Legal HPWL: 681580734 Time: 0.0 sec (0.0 min)
Detail HPWL: 333222011 Time: 4.0 sec (0.1 min)
=====
HPWL: 333222011 Time: 6.0 sec (0.1 min)
```

ibm05:

```

///// Legalization /////
macro size: 0
legalization success!

HPWL: 10064120 (0.20%)

///// Detail Placement /////
run: 0 HPWL=9994833 (-0.688%)(-0.688%)   time: 0 sec   all: 0 sec
run: 1 HPWL=9979375 (-0.155%)(-0.842%)   time: 0 sec   all: 0 sec
run: 2 HPWL=9973292 (-0.061%)(-0.902%)   time: 0 sec   all: 1 sec

HPWL: 9973292 (-0.90%)

/////////////////////////
Benchmark: ibm05

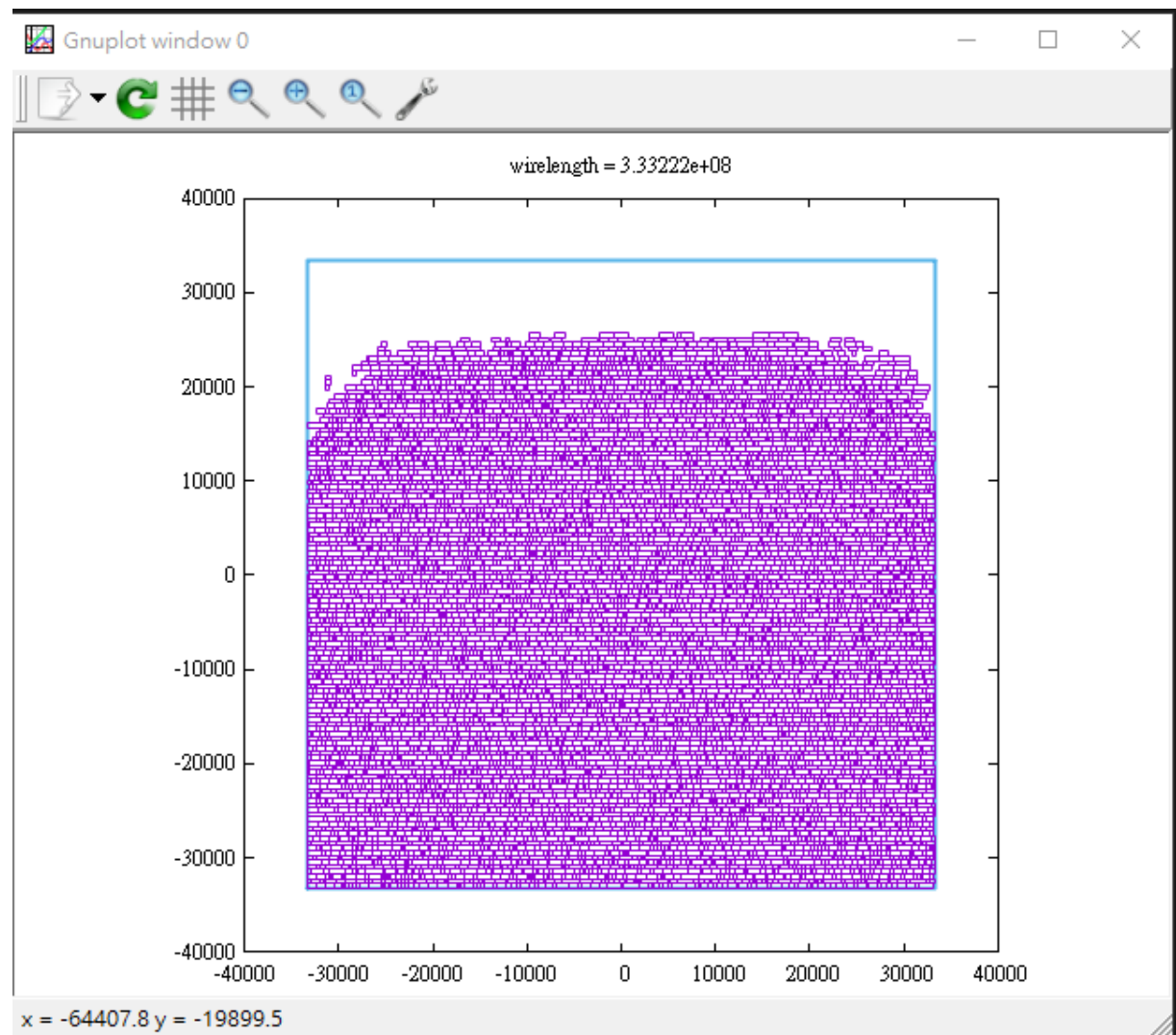
Global HPWL: 10728134   Time:    1.0 sec (0.0 min)
Legal HPWL: 10064120   Time:    0.0 sec (0.0 min)
Detail HPWL: 9973292   Time:    1.0 sec (0.0 min)
=====
HPWL: 9973292   Time:    2.0 sec (0.0 min)
=====

```

	Legal?	Global HPWL	Legal HPWL	Detail HPWL	time
lbm01	YES	5899472	681580734	333222011	6s
lbm05	YES	10728134	2.23e+07	9973292	2s

Placement Visualization (GNU plot):

lbm01:



lbm05:

