

(b) 說明 thread 的分工

僅用於建樹。

(c) thread 數量與時間比較

| Thread 數量 | Real time | User time |
|-------------------------------------|-----------|-----------|
| //with 50 tree, each with 500 data | | |
| 1 | 1'46"837 | 3'19"270 |
| 2 | 1'11"529 | 2'38"204 |
| 3 | 0'48"182 | 2'29"343 |
| 4 | 0'40"682 | 2'26"977 |
| 8 | 0'29"089 | 2'32"089 |
| 16 | 0'26"208 | 2'28"987 |
| 32 | 0'25"476 | 2'24"041 |
| 64 and above | 0'24"... | 2'19"495 |
| | | |
| //with 200 tree, each with 200 data | | |
| 1 | 1'20"173 | 2'22"262 |
| 2 | 0'43"687 | 1'35"862 |
| 4 | 0'33"282 | 1'32"571 |
| 8 | 0'28"398 | 1'33"951 |
| 16 | 0'25"616 | 1'29"271 |
| 32 | 0'24"016 | 1'27"388 |
| 64 | 0'23"710 | 1'26"498 |
| 128 | 0'23"675 | 1'25"638 |
| 256 | 0'24"818 | 1'26"541 |

多個thread同時執行會明顯降低 real time ，但由於 thread 僅用於建樹，testing 所花的時間並無節省。因為工作站提供同時最多16個thread同時進行，超過16個 thread 之後，增加thread數目不再使run time有明顯的變化。

(d) thread 數量與 instruction 數量比較

| Thread 數量 | Instruction | Time elapsed |
|-------------------------------------|-----------------|--------------|
| //with 200 tree, each with 200 data | | |
| 1 | 274,141,002,591 | 72.028548077 |
| 2 | 174,917,061,020 | 42.972930462 |
| 4 | 129,952,502,188 | 32.278161886 |
| 8 | 102,212,268,153 | 28.318928608 |
| 16 | 89,029,906,617 | 25.996703279 |
| 32 | 80,466,259,469 | 25.435115288 |
| 64 | 79,280,502,726 | 23.741984939 |
| 128 | 77,522,046,633 | 23.520642466 |
| 256 | 77,117,167,429 | 23.500028104 |

(e) tree 數量與 instruction 數量比較

| Tree 數量 | Instruction | Time elapsed |
|-------------------------------------|---------------|--------------|
| //16thread, each tree with 200 data | | |
| 1 | 2,525,301,793 | 1.224898747 |
| 2 | 2,890,401,610 | 1.325813398 |
| 4 | 3,629,255,984 | 1.731798288 |
| 8 | 5,330,902,051 | 2.013894249 |
| 16 | 8,161,852,254 | 2.858797386 |

| | | |
|-----|-----------------|--------------|
| 32 | 14,851,602,482 | 4.926435843 |
| 64 | 28,675,522,679 | 8.465025929 |
| 128 | 57,454,547,482 | 15.965280492 |
| 256 | 113,796,630,042 | 32.423701174 |

instruction 大部分在建樹上，將樹的數量加倍也會使instruction加倍。

(f) 其他發現

正確率：僅需要20棵樹，每棵樹給20筆資料，即可使正確率穩定再85%以上。跑很多棵大棵的樹有助於使正確率上升至約90%，但很難再更高。

make run裡的 tree_number=500, thread_number=16，可達正確率89~90%，需時約1分鐘。