

2021 NYCU OS HW3 report

Question	Answer
<p>Q1.</p> <p>Briefly describe your design for the sorting algorithm, merge function, the thread management.</p> <p>Also, describing the number of sort threads and number of merge threads in the Multi-thread program.</p>	<p>首先在 sorting 的部分我用的是 insertion sorting，與一般 code 的地方不同的是，我們需要先把傳進來的 argument 分解成需要的 start 跟 end 再根據變數做 sorting。</p> <p>Merge 的部分一樣會傳進 argument，我把它分成三類：start, mid, end，根據這三項變數依據決定要 merge 的兩個 vector 分別從哪裡開始。除了一般 merge 之外，我還在 multithread 的 best case 裡多定義了一個 merge_last function，避免最後要 merge 的部分取到舊的還沒做 sorting 的數字。</p> <p>在 thread management 的部分我分別建立了 1, 3, 7 個 thread 的集合來處理每個 thread 的執行。</p> <p>而我在 multithread program 中把 partition 分別設定為 2 等份（worst case, same as single thread）與 4 等份（best case），兩者我都只使用了兩個 thread。</p>
<p>Q2.</p> <p>Show the fastest time acceleration between single-thread and multi-thread. (Take screenshots of the time between single-thread and multi-thread)</p>	 <pre> sunny@ubuntu:~/Desktop/OS/Lab3\$ time ./0 real 11m22.167s user 11m21.027s sys 0m0.300s ST for input2.txt sunny@ubuntu:~/Desktop/OS/Lab3\$ diff -s Files answer2.txt and output2.txt are identical sunny@ubuntu:~/Desktop/OS/Lab3\$ time ./0 real 5m54.271s user 11m45.089s sys 0m0.920s MT_worst for input2.txt sunny@ubuntu:~/Desktop/OS/Lab3\$ diff -s Files answer2.txt and output2.txt are identical sunny@ubuntu:~/Desktop/OS/Lab3\$ time ./0 real 2m51.645s user 5m41.786s sys 0m0.288s MT_best for input2.txt </pre>

Q3.

You need a brief description of the best multi-threads and worst multi-threads methods.

The content includes the number of threads used and the way of partitioning, comparing the difference in time, and taking the screenshot between two multi-thread results.

如上面所述，我在 multithread 中皆用了 2 個 thread，worst case partition 成 2 等份，best case partition 成 4 等份。將資料減為一半後，best case 相較於 worst case 執行時間減少了近一半。不會變成 n^2 的原因是因為只有兩條 thread，所以 best case 的另外兩等份需要等前面兩等份做完才執行。

```
sunny@ubuntu:~/Desktop/OS/Lab3$ g++ -o 0816039_M
sunny@ubuntu:~/Desktop/OS/Lab3$ time ./0816039_M
real    0m0.050s
user    0m0.065s
sys     0m0.007s
sunny@ubuntu:~/Desktop/OS/Lab3$ g++ -o 0816039_M
sunny@ubuntu:~/Desktop/OS/Lab3$ time ./0816039_M
real    0m0.026s
user    0m0.036s
sys     0m0.004s
sunny@ubuntu:~/Desktop/OS/Lab3$ time ./0816039_M
real    5m54.271s
user    11m45.089s
sys     0m0.920s
sunny@ubuntu:~/Desktop/OS/Lab3$ diff -s answer2.
Files answer2.txt and output2.txt are identical
sunny@ubuntu:~/Desktop/OS/Lab3$ time ./0816039_M
real    2m51.645s
user    5m41.786s
sys     0m0.288s
```

MT_worst for input1.txt

MT_best for input1.txt

MT_worst for input2.txt

MT_best for input2.txt

Q4.

What did you learn from doing hw3?

我學到要如何實際撰寫 thread 以及利用它能平行化的優點來加速程式的運行。同時也回憶起怎麼從零開始寫 sorting、merging，和 structure。