Assignment 5 report

Task:

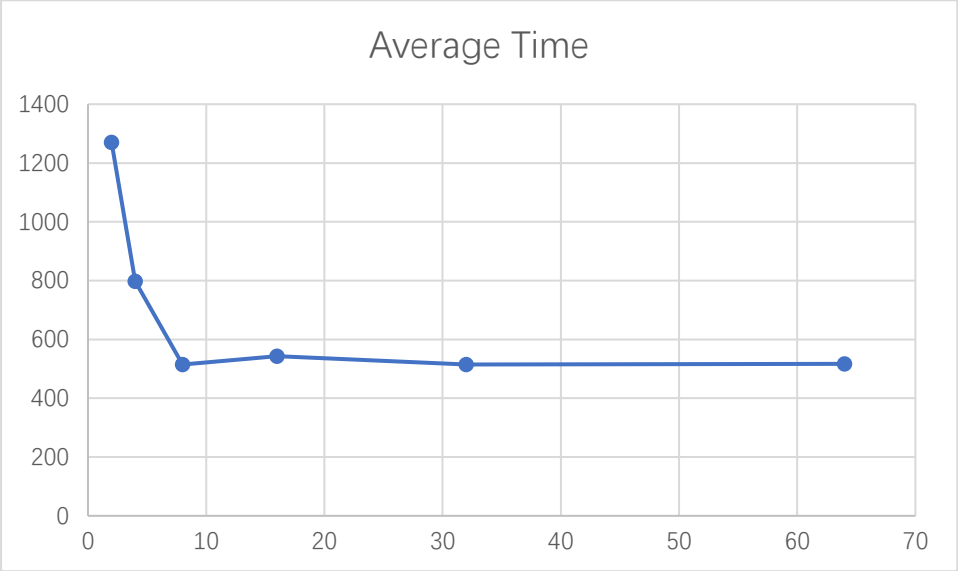
1. A cutoff (defaults to, say, 1000) which you will update according to the first argument in the command line when running. It's your job to experiment and come up with a good value for this cutoff. If there are fewer elements to sort than the cutoff, then you should use the system sort instead.
2. Recursion depth or the number of available threads. Using this determination, you might decide on an ideal number (*t*) of separate threads (stick to powers of 2) and arrange for that number of partitions to be parallelized (by preventing recursion after the depth of *lg t* is reached).
3. An appropriate combination of these.

Degree of parallelism:

I first test the degree of parallelism using different cutoffs and calculate the average time. From the graph, the average time decreases when the degree of parallelism increases, until 8, which is the actual cores my CPU has (I'm using an 8 core 16 threads CPU).

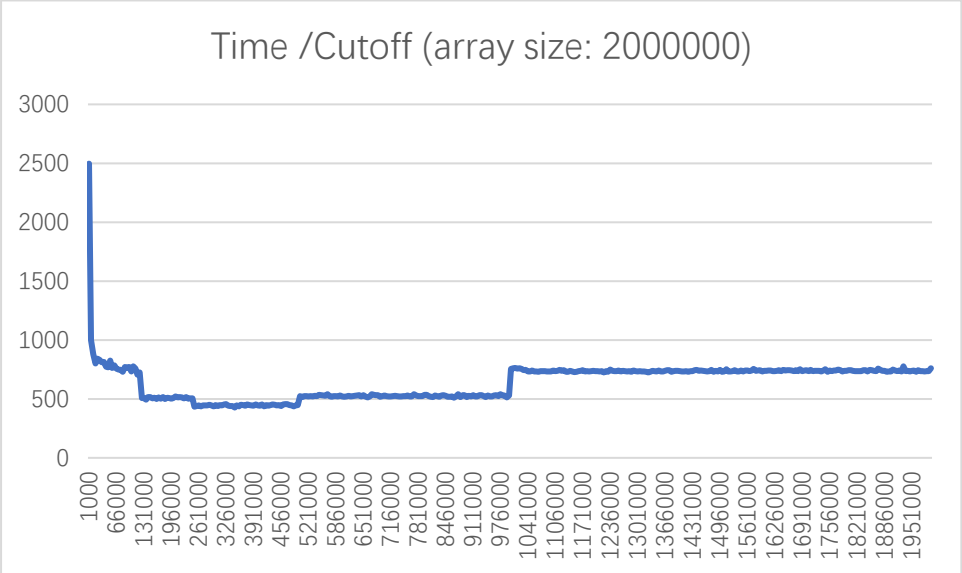
For my computer, a degree of 8 has the best performance.

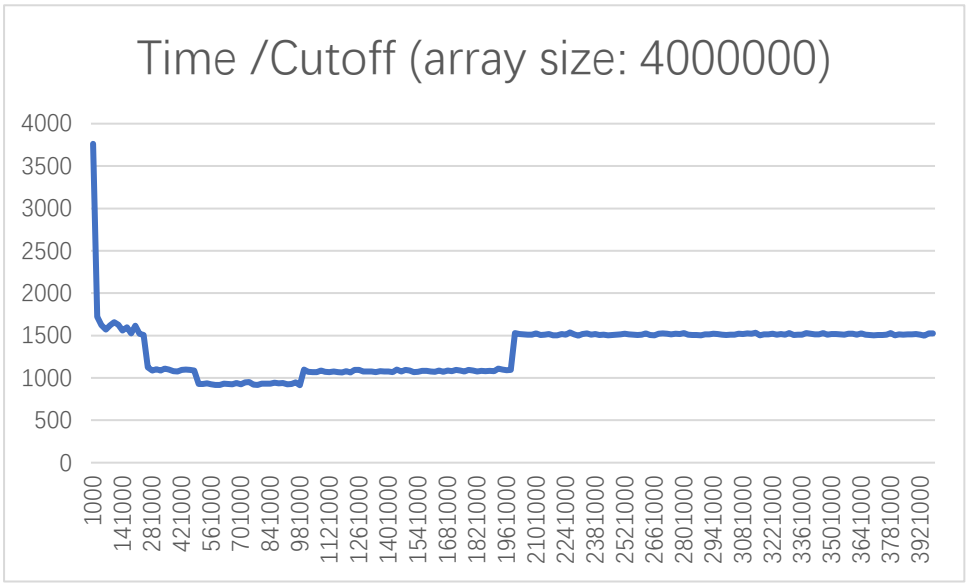
Degree of parallelism	Average Time
2	1270.26
4	797.6
8	514.7
16	543.08
32	514.76
64	516.6

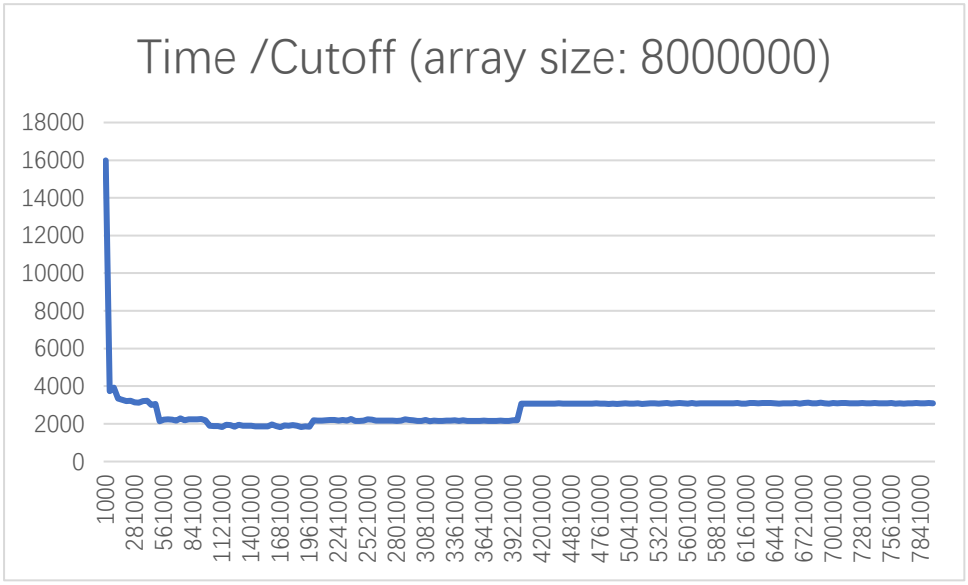


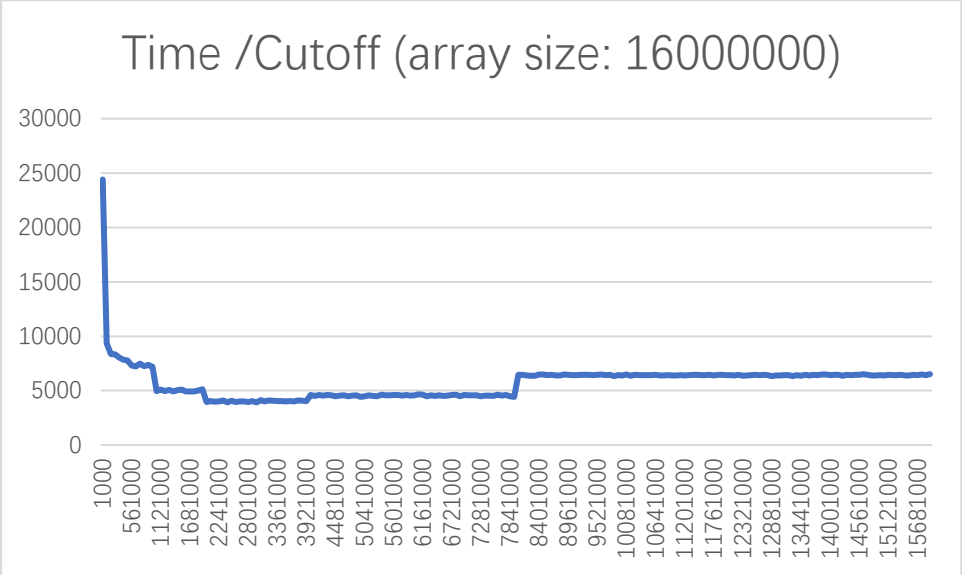
Cutoff and Array Size:

I test different cutoffs on different array sizes using same degree of parallelism:




Time /Cutoff (array size: 4000000)
4000
3500
3000
2500
2000
1500
1000
500
0
1000
141000
281000
421000
561000
701000
841000
981000
1121000
1261000
1401000
1541000
1681000
1821000
1961000
2101000
2241000
2381000
2521000
2661000
2801000
2941000
3081000
3221000
3361000
3501000
3641000
3781000
3921000


Time /Cutoff (array size: 8000000)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1000
281000
561000
841000
1121000
1401000
1681000
1961000
2241000
2521000
2801000
3081000
3361000
3641000
3921000
4201000
4481000
4761000
5041000
5321000
5601000
5881000
6161000
6441000
6721000
7001000
7281000
7561000
7841000



It can be seen from the graphs; the minimum time appears at where the cutoff is between 1/8 to 1/4 of the array size.

From my observations, the best cutoff is between 1/8 to 1/4 of the array size.

All test data are attached at assignment5_data.pdf