**MATLAB科学计算HW\_2**

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【1】

a. The complexity of MyMax(finding maximum and minimum number in array A) is Θ(n).

b. There are in total 3^(n\*m) possible layout of the chessboard. Therefore the complexity of the algorithm should beΘ(3^(n\*m)).

【2】

a. **Theoretically, bubble sort should be faster than Sort1.**

For bubble sort, the maximum times of calculation needed is 1+=1+3(n-1)+5n(n-1)/2=5n2/2+n/2-2 (n>=2)

For Sort1, the maximum times of calculation needed is n[2+3(n-1)+2]=3n2+n (n>=2)

Apparently the latter is larger than the former (difference always > 0).

b. Trial in Matlab with file “2b\_TimeBS1.m” for two times. The results are as follows.

|  |  |  |
| --- | --- | --- |
| Test File Name | Time\_BubbleSort (s) | Time\_Sort1 (s) |
| Test\_256.m | 0.005977 | 0.011495 |
| Test\_4096.m | 0.279804 | 0.088276 |
| Test\_65536.m | 63.222516 | 22.704812 |
| Test\_1048576.m | Not able to complete\* | Not able to complete\* |

|  |  |  |
| --- | --- | --- |
| Test File Name | Time\_BubbleSort (s) | Time\_Sort1 (s) |
| Test\_256.m | 0.001436 | 0.001239 |
| Test\_4096.m | 0.231716 | 0.152668 |
| Test\_65536.m | 59.453529 | 21.229748 |
| Test\_1048576.m | Not able to complete\* | Not able to complete\* |

**Practically, Sort1 is somehow faster than BubbleSort.**

\*: waited over 30 minutes, no results displayed.

【3】

a. Tested the speed of Sort1 and MergeSort respectively with array containing (512\*2^n) numbers (n=0:10) in file “3a\_TimeTrial.m”.

When n>=1, i.e., when there are 1024 or more numbers in the array, MergeSort would be faster than Sort1.

Therefore, 1024 is picked as n in MergeSort2.

Function MergeSort2 is in file “MergeSort2.m”.

b. Tested the speed of Sort1, MergeSort and MergeSort2 respectively with file “3b\_Time.m” for 2 times. B is the array containing prespecific number in the sorted AS. The elapse time is the operating time for Sort1, MergeSort and MergeSort2 respectively from top to bottom.

(Chart on next page)

|  |  |  |
| --- | --- | --- |
| File name | Test 1 | Test 2 |
| Test\_256.m | Elapsed time is 0.002545 seconds.  Elapsed time is 0.003033 seconds.  Elapsed time is 0.004840 seconds.  B =  0.0007  0.1659  0.2347  0.4438  0.9966 | Elapsed time is 0.000997 seconds.  Elapsed time is 0.002596 seconds.  Elapsed time is 0.001047 seconds.  B =  0.0007  0.1659  0.2347  0.4438  0.9966 |
| Test\_4096.m | Elapsed time is 0.086085 seconds.  Elapsed time is 0.019726 seconds.  Elapsed time is 0.022254 seconds.  B =  0.0000  0.1423  0.2010  0.4284  0.9999 | Elapsed time is 0.092279 seconds.  Elapsed time is 0.018883 seconds.  Elapsed time is 0.020741 seconds.  B =  0.0000  0.1423  0.2010  0.4284  0.9999 |
| Test\_65536.m | Elapsed time is 21.916422 seconds.  Elapsed time is 0.301678 seconds.  Elapsed time is 0.305445 seconds.  B =  0.0000  0.1435  0.2013  0.4265  1.0000 | Elapsed time is 21.672453 seconds.  Elapsed time is 0.308071 seconds.  Elapsed time is 0.447742 seconds.  B =  0.0000  0.1435  0.2013  0.4265  1.0000 |
| Test\_1048576.m | Not able to complete\* | Not able to complete\* |

\*: waited over 30 minutes, no results displayed.