CSE 5311 Design and Analysis of Algorithms

You are required to submit the code, sample data, results, a one page report, and instructions for executing the code to the TA

Assignment Problem:

The Quicksort algorithm is an efficient and popular sorting technique that sorts a list of keys S[1], S[2], . . ., S[n], recursively by choosing a pivot key. The best-case running time of Quicksort is $O(n \log_2 n)$ and its worst-case running time is $O(n^2)$. Several improvements and modifications have been proposed to improve Quicksort's worst-case behavior. For example, the paper by Wainwright [1] presents *Bsort*, a variation of Quicksort that combines Bubble-sorting techniques with the Quicksort algorithm. Other methods include, Quickersort[2], qsort[3], CKsort[4]. You can choose ONE improvisation of Quicksort (of your choice) – let's call it MY_CHOICE_QSORT. You can choose a method not listed above, but please include the reference in your report.

Write programs to implement sorting algorithms that employ MY_CHOICE_QSORT, Quicksort, Mergesort and Heapsort for sorting keys. Execute your sorting programs for the following sets of data:

a. Set_1 – Ordered List
b. Set_2 - Reverse order List
c. Set_3 – A list containing the same value through out
d. Set_4 – Random List
e. Set_5 – 25% of the List sorted

PLEASE NOTE THAT your PROGRAMS WILL BE TESTED WITH DIFFERNET DATA SETS AS WELL

Presentation of Results: Measure CPU time, number of partitions (only for Quicksort and, MY_CHOICE_QSORT) and number of comparisons for data sizes 1000, 10K, and 1M. Present your results using tables or graphs and write a 1-page report. The report should have a psuedocode for MY_CHOICE_QSORT and summarize the behavior of all Sorting algorithms tested and their suitability.

References

[1] R.L. Wainwright, *A Class of Sorting Algorithms based on Quicksort*, Communications of the ACM, Vol. 28, No. 4, April 1985, pgs. 396-402.

[2] R.S. Scowen, *Algorithm 271: Quicksort*, Communications of the ACM, Vol. 8, No. 11, Nov. 1965, pgs. 669-670.

[3] M.N. vanEmden, *Algorithm 402: Increasing the efficiency of Quicksort*, Communications of the ACM, Vol. 13, No. 11, Nov. 1970, pgs. 693-694.

[4] C.R. Cook, and Kim D.J, *Best sorting algorithm for nearly sorted lists*, Communications of the ACM, Vol. 23, No. 11, Nov. 1980, pgs. 620-624.

[5] C.A.R. Hoare, Algorithm 64:*Quicksort*, Communications of the ACM, Vol. 4, No. 7, July 1961, pg. 321.