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References:

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|  | https://www.geeksforgeeks.org/shuffle-a-given-array-using-fisher-yates-shuffle-algorithm/ |
|  | https://www.cs.upc.edu/~conrado/research/reports/ALCOMFT-TR-03-50.pdf |
|  | Partial QuickSort- Conrado Martinez |

METHODS

1. Fischer Yates shuffling was used to shuffle the array using uniform random int generator.

2. Randomized versions of Lomuto and Hoare partitioning schemes were created and tested for an array for size up to 10^8 elements.

3. partialQuicksort method was used with arbitrary k to sort elements such that each unsorted element was at most k elements far from the pivot.

4. Knuth Quicksort employed partialQuicksort and insertionSort consecutively to sort the almost sorted array.

Sys config:

Windows 10 pro 64bit

AMD Ryzen 7 3700x 8-Core Processor 3693Mhz 8 cores 16 logical processors

n = 10^7

tolerance = 5

Optimum k is taken from the average of k1 and k2, k1 is initialized as 10 and k2 as 1000.

Optimum K: 505

Runtime in microseconds: 2.7519e+06 for k= 389

Runtime in microseconds: 3.89469e+06 for k= 621

Optimum K: 315

Runtime in microseconds: 2.25076e+06 for k= 244

Runtime in microseconds: 3.12713e+06 for k= 389

Optimum K: 199

Runtime in microseconds: 2.10475e+06 for k= 155

Runtime in microseconds: 2.25384e+06 for k= 244

Optimum K: 127

Runtime in microseconds: 1.88518e+06 for k= 100

Runtime in microseconds: 2.05722e+06 for k= 155

Optimum K: 82

Runtime in microseconds: 1.92574e+06 for k= 66

Runtime in microseconds: 1.91281e+06 for k= 100

Optimum K: 110

Runtime in microseconds: 1.93861e+06 for k= 100

Runtime in microseconds: 1.95564e+06 for k= 121

Optimum K: 104

Runtime in microseconds: 1.76066e+06 for k= 100

Runtime in microseconds: 1.66653e+06 for k= 108

Optimum K: 110

Runtime in microseconds: 1.8012e+06 for k= 108

Runtime in microseconds: 1.94856e+06 for k= 112

Optimum K: 106

Runtime in microseconds: 1.983e+06 for k= 105

Runtime in microseconds: 1.81315e+06 for k= 108

Optimum K: 108

Runtime in microseconds: 1.77107e+06 for k= 108

Runtime in microseconds: 1.67975e+06 for k= 109

Optimum K: 110

Optimum k is : 110

0 1 2 3 4 ...9999995 9999996 9999997 9999998 9999999

7345841 3679061 2745527 5048694 2898165 ...8430803 5596034 1781954 5253066 6786953

Runtime in microseconds: 1.92593e+06 for k= 110

0 1 2 3 4 ...9999995 9999996 9999997 9999998 9999999