ECSE210L: Design and Analysis of Algorithms

Lab 12 (Week 16: April 20-24 , 2020)

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In this lab, you are expected implement the randomized quick sort algorithm where you select the pivot, in each round, uniformly random from the set of elements. This can be done by generating a random number / integer between 1 to n, where n is the size of the input.

Further, show us the input in each round, pivot, and partition of the input array explicitly for the following input: $10, 5, 7, 9, 12, 17, 4, 8, 2, 11$

Sample Output:

(1) **First Run :**
Given array of elements : [10, 5, 7, 9, 12, 17, 4, 8, 2, 11]
Sorting elements between : 0 9
index, pivot : 2 7
modified array : [5, 4, 2, 7, 12, 17, 10, 8, 11, 9]
Sorting elements between : 0 2
index, pivot : 1 4
modified array : [2, 4, 5, 7, 12, 17, 10, 8, 11, 9]
Sorting elements between : 0 0
Sorting elements between : 2 2
Sorting elements between : 4 9
index, pivot : 5 17
modified array : [2, 4, 5, 7, 12, 9, 10, 8, 11, 17]
Sorting elements between : 4 8
index, pivot : 8 11
modified array : [2, 4, 5, 7, 9, 10, 8, 11, 12, 17]
Sorting elements between : 4 6
index, pivot : 4 9
modified array : [2, 4, 5, 7, 8, 9, 10, 11, 12, 17]
Sorting elements between : 4 4
Sorting elements between : 6 6
Sorting elements between : 8 8
Sorting elements between : 10 9
Sorted array of elements : [2, 4, 5, 7, 8, 9, 10, 11, 12, 17]

(2) **Second run :**
Given array of elements : [10, 5, 7, 9, 12, 17, 4, 8, 2, 11]
Sorting elements between : 0 9
index, pivot : 1 5
modified array : [4, 2, 5, 9, 12, 17, 10, 8, 11, 7]
Sorting elements between : 0 1
index, pivot : 0 4
modified array : [2, 4, 5, 9, 12, 17, 10, 8, 11, 7]
Sorting elements between : 0 0
Sorting elements between : 3 9
index, pivot : 5 17
modified array : [2, 4, 5, 9, 12, 7, 10, 8, 11, 17]
Sorting elements between : 3 8
index, pivot : 8 11
modified array : [2, 4, 5, 9, 7, 10, 8, 11, 12, 17]
Sorting elements between : 3 6
index, pivot : 4 7
modified array : [2, 4, 5, 7, 8, 10, 9, 11, 12, 17]
Sorting elements between : 4 6
index, pivot : 4 8
modified array : [2, 4, 5, 7, 8, 10, 9, 11, 12, 17]
Sorting elements between : 5 6
index, pivot : 6 9
modified array : [2, 4, 5, 7, 8, 9, 10, 11, 12, 17]
Sorting elements between : 6 6
Sorting elements between : 8 8
Sorted array of elements : [2, 4, 5, 7, 8, 9, 10, 11, 12, 17]
    You can observe in the both runs the pivot element positions are not the same
at the respective iteration and all pivot positions are random.
    In the submission, include your output, at least three runs of the same code.