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Naive Partition

Quicksort is a Divide and Conquer Algorithm that is used for sorting the elements. In this algorithm, we choose a pivot and partitions the given array according to the pivot. Quicksort algorithm is a mostly used algorithm because this algorithm is cache-friendly and performs in-place sorting of the elements means no extra space requires for sorting the elements.

Note:

> Quicksort algorithm is generally unstable algorithm because quick sort cannot be able to maintain the relative
> order of the elements.

Three partitions are possible for the Quicksort algorithm:

1. **Naive partition:** In this partition helps to maintain the relative order of the elements but this partition takes O(n) extra space.
2. **Lomuto partition:** In this partition, The last element chooses as a pivot in this partition. The pivot acquires its required position after partition but more comparison takes place in this partition.
3. **Hoare's partition:** In this partition, The first element chooses as a pivot in this partition. The pivot displaces its required position after partition but less comparison takes place as compared to the Lomuto partition.

1. Naive partition

Algorithm:

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```
Naivepartition(arr[],l,r)

1. Make a Temporary array temp[r-l+1] length
2. Choose last element as a pivot element
3. Run two loops:
    -> Store all the elements in the temp array that are less than pivot element
    -> Store the pivot element
    -> Store all the elements in the temp array that are greater than pivot element.
4.Update all the elements of arr[] with the temp[] array



QuickSort(arr[], l,  r)



If r > l
     1. Find the partition point of the array
              m = Naivepartition(a,l,r)
     2. Call Quicksort for less than partition point
             Call Quicksort(arr, l, m-1)
     3. Call Quicksort for greater than the partition point
             Call Quicksort(arr, m+1, r)
```

Java

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```java
// Java program to demonstrate the naive partition
// in quick sort

import java.io.*;
import java.util.*;
public class GFG {
    static int partition(int a[], int start, int high)
    {
        // Creating temporary
        int temp[] = new int[(high - start) + 1];

        // Choosing a pivot
        int pivot = a[high];
        int index = 0;

        // smaller number
        for (int i = start; i <= high; ++i) {
            if (a[i] < pivot)
            {
                temp[index++] = a[i];
            }
        }

        // pivot position
        int position = index;

        // Placing the pivot to its original position
        temp[index++] = pivot;
```

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```
        for (int i = start; i <= high; ++i)
        {
            if (a[i] > pivot)
            {
                temp[index++] = a[i];
            }
        }

        // Change the original array
        for (int i = start; i <= high; ++i) {
            a[i] = temp[i - start];
        }

        // return the position of the pivot
        return position;
    }

    static void quicksort(int numbers[], int start, int end)
    {
        if (start < end) {
            int point = partition(numbers, start, end);

            quicksort(numbers, start, point - 1);
```

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```
    }

    // Function to print the array
```

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```
    static void print(int numbers[])
    {
        for (int a : numbers)
        {
            System.out.print(a + " ");
        }
    }

    public static void main(String[] args)
    {
        int numbers[] = { 3, 2, 1, 78, 9798, 97 };

        // rearrange using naive partition
        quicksort(numbers, 0, numbers.length - 1);

        print(numbers);
    }
}
```

Output

```
1 2 3 78 97 9798
```

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