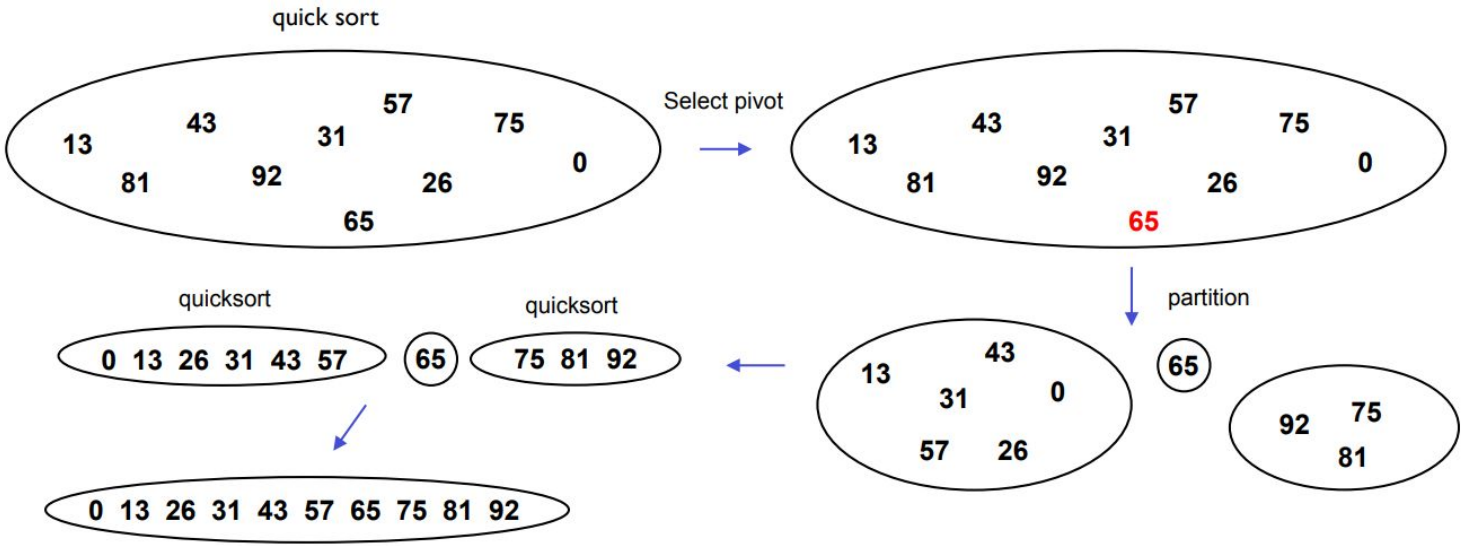
Lab 13: Quick Sort

Data Structure 2023

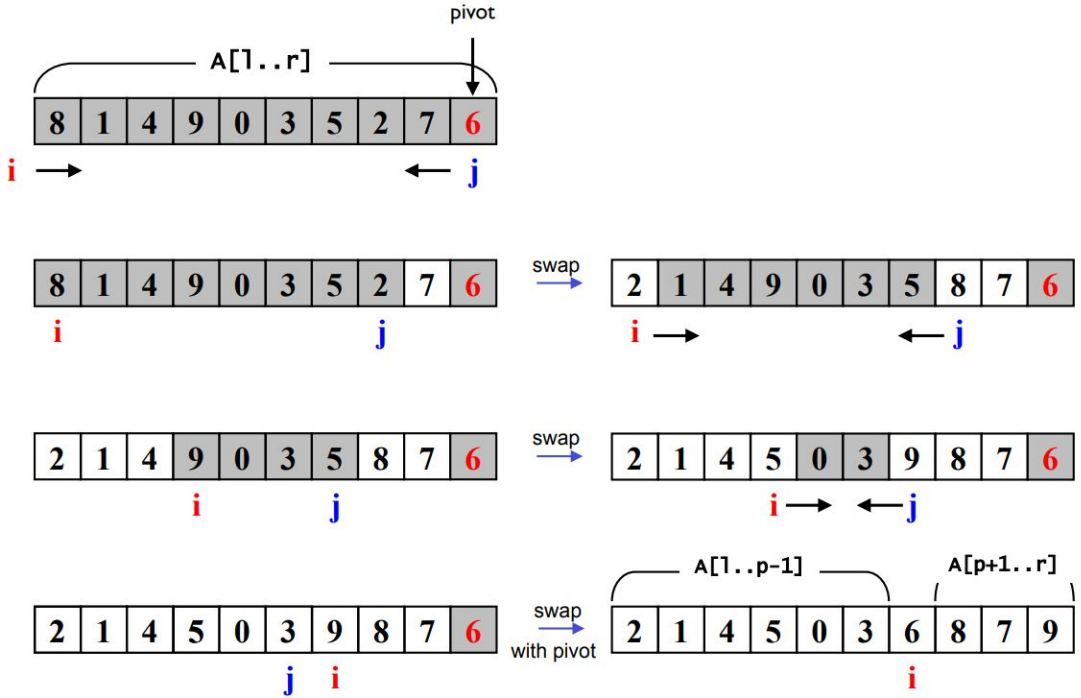
Quick Sort

- Sorting
  - Sorting is putting the elements into a list in which the elements are in **increasing order**
- Quick Sort
  - Divide: partition the array A[l..r] into two subarrays A[l..p-1] and A[p+1..r]
    - All elements in A[l..p-1] are less than or equal to a pivot element A[p]
    - All elements in A[p+1..r] are greater than pivot element A[p].
  - Conquer: sort the two subarrays A[l..p-1] and A[p+1..r] by recursive calls to quicksort.
    - Since the subarrays are sorted in place, no work is needed.

Quick Sort


quick sort
13 43 31 57 75 0 81 92 26 65
Select pivot
13 43 31 57 75 0 81 92 26 65
partition
13 43 31 0 57 26
65
92 75 81
quicksort
0 13 26 31 43 57
65
quicksort
75 81 92
0 13 26 31 43 57 65 75 81 92

Quick Sort


pivot
A[l..r]
8 1 4 9 0 3 5 2 7 6
i
j
8 1 4 9 0 3 5 2 7 6
i
j
swap
2 1 4 9 0 3 5 8 7 6
i
j
2 1 4 9 0 3 5 8 7 6
i
j
swap
2 1 4 5 0 3 9 8 7 6
i
j
2 1 4 5 0 3 9 8 7 6
j
i
swap
with pivot
A[l..p-1]
A[p+1..r]
2 1 4 5 0 3 6 8 7 9
i

Quick Sort ADT

- **Array* CreateArray(int size)**
  - Create an array with the input size.
- **void QuickSort(Array* array, int left, int right)**
  - Perform quick sort on the interval [left, right].
- **int Partition(Array* array, int left, int right)**
  - Set the pivot and obtain the proper index of the pivot through the swapping.
- **void PrintArray(Array* array, int left, int right)**
  - Print all values of the array on the interval [left, right].
- **void DeleteArray(Array* array)**
  - Delete an array.

Quick Sort ADT

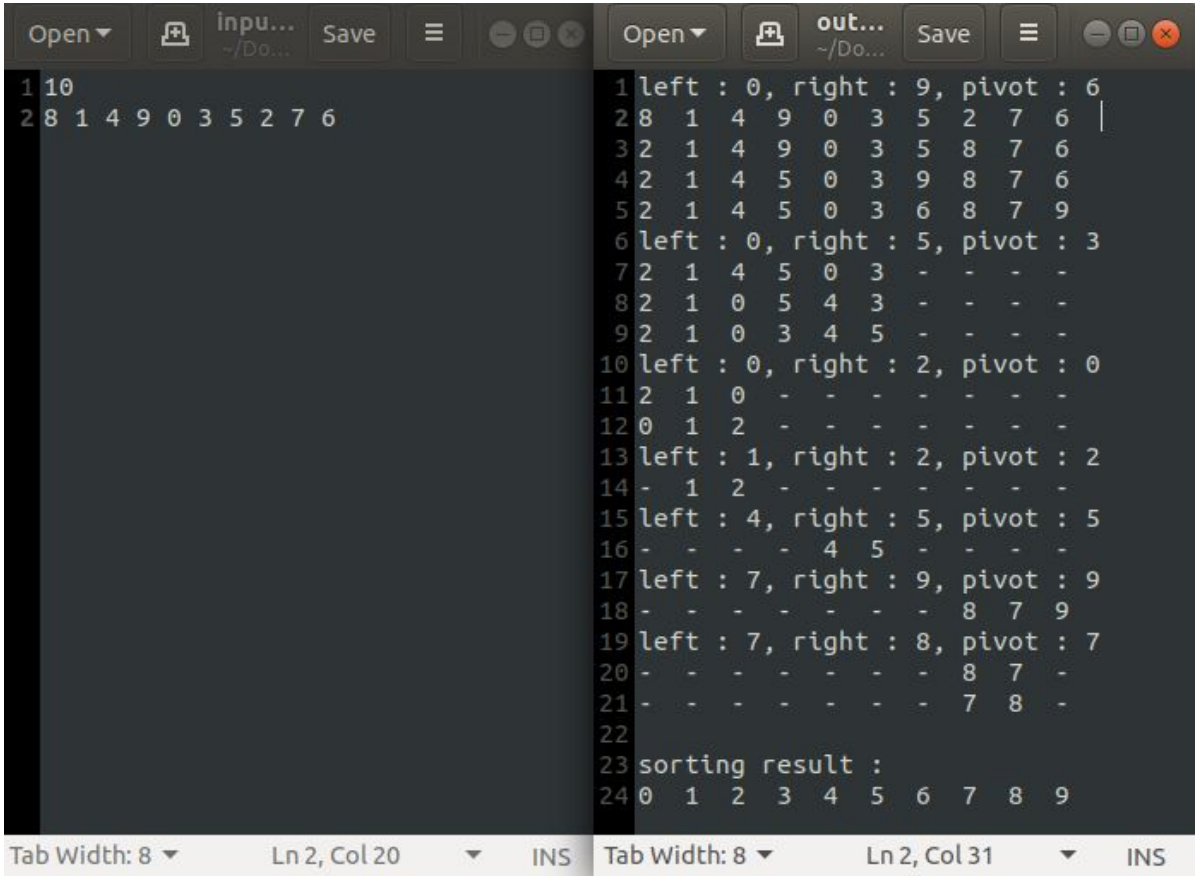
Structure

```
typedef struct Array Array;
struct Array{
    int size;
    int* values;
};
```

Function

```
Array* CreateArray(int size);
void QuickSort(Array* array, int left, int right);
int Partition(Array* array, int left, int right);
void PrintArray(Array* array, int left, int right);
void DeleteArray(Array* array);
```

Input & Output Example



Assignment

- Due
  - **~ 2023.06.14(수) 23:59**
  - Last Commit 기준

- 자세한 내용은 과제 명세 PDF 파일 참고