

Course title : **CSE2001**
Course title : **Data Structures and Algorithms**
Module : **4**
Topic : **2**

Quick Sort

Objectives

This session will give the knowledge about

- Quick sort

Quick Sort

Quick sort is a **fast sorting algorithm** used to sort a list of elements. Quick sort algorithm is invented by **C. A. R. Hoare**.

The quick sort algorithm attempts to separate the list of elements into two parts and then sort each part recursively.

The list is divided into two partitions such that "**all elements to the left of pivot are smaller than the pivot and all elements to the right of pivot are greater than or equal to the pivot**".

Quick Sort Partition approach

```
Partition(A, start, end)
{
  Pindex<- start
  for i<- start to end-1
  {
    If(A[i]<= pivot)
    {
      Swap(A[i], A[pindex])
      Pindex<-Pindex+1
    }
  }
}
```

```
Swap(A[pindex],A[end])
return Pindex
}
```

Quick Sort

```
Quicksort(A, start,end)
{
  If(start<end)
  {
    Pindex<- partition(A, start,end)
    Quicksort(A, start, Pindex-1)
    Quicksort(A, Pindex+1,end)
  }
}
```

Complexity Analysis

| Algorithm | Time Complexity | | |
|----------------|---------------------|---------------------|----------------|
| | Best | Average | Worst |
| Selection Sort | $\Omega(n^2)$ | $\theta(n^2)$ | $O(n^2)$ |
| Bubble Sort | $\Omega(n)$ | $\theta(n^2)$ | $O(n^2)$ |
| Insertion Sort | $\Omega(n)$ | $\theta(n^2)$ | $O(n^2)$ |
| Heap Sort | $\Omega(n \log(n))$ | $\theta(n \log(n))$ | $O(n \log(n))$ |
| Quick Sort | $\Omega(n \log(n))$ | $\theta(n \log(n))$ | $O(n^2)$ |
| Merge Sort | $\Omega(n \log(n))$ | $\theta(n \log(n))$ | $O(n \log(n))$ |
| Bucket Sort | $\Omega(n+k)$ | $\theta(n+k)$ | $O(n^2)$ |
| Radix Sort | $\Omega(nk)$ | $\theta(nk)$ | $O(nk)$ |

Summary

At the of this session we learned about

- Quick sort