Design Algorithm and Analysis

# Lab – 4: Merge Sort

Aim :

To perform Merge sort on Randomly Generate array

Introduction :

Merge sort is a sorting algorithm that uses a divide-and-conquer approach to sort an array or a list of elements. The basic idea behind the algorithm is to divide the input array into two equal-sized arrays, sort each spllited array individually, and then merge the two sorted arrays back into a single, sorted array. The algorithm uses recursion to repeatedly divide the input array into smaller and smaller arrays until each subarray contains only a single element, which are already considered sorted. The merge step then combines the sorted arrays back into a single, sorted array. Merge sort has a time complexity of O(n log n), making it more efficient than some other sorting algorithms such as bubble sort or insertion sort.

Algorithm :

1) Divide the input array into two equal-sized subarrays.

2) Recursively sort each subarray by calling the merge sort function on each subarray.

3) Merge the two sorted subarrays back into a single, sorted array.

PseudoCode :

function mergeSort(array)

    if (length of array <= 1) return array

    middle = length of array / 2

    left = mergeSort(subarray of array from 0 to middle)

    right = mergeSort(subarray of array from middle to end)

    return merge(left, right)

function merge(left, right)

    result = empty array

    while (left and right are not empty)

        if (first element of left <= first element of right)

            append first element of left to result

            remove first element of left

        else

            append first element of right to result

            remove first element of right

    while (left is not empty)

        append first element of left to result

        remove first element of left

    while (right is not empty)

        append first element of right to result

        remove first element of right

    return result

Result :

Application :

1) Sorting large Datasets

2) Sorting in Parallel and Distributed System

3) Sorting in External Memory

4) Sorting in Version Control

Reference :

Performance Anaylsis of Merge Sort Algorithm

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