

PROJECT REPORT

Abstract:

Comparison of sorting algorithms: Merge sort vs Quick sort vs some $O(n^2)$ algorithm for sorting (e.g., Insertion sort, Bubble sort).

Problem Statement:

1. Implement Merge Sort, Quick Sort and Insertion Sort
2. Compare the Run time complexity.

Results:

Following table shows the performance of the Prim's implementation as input size changes.

Part 1:

Size:1000000

Elements in the array are random

Merge Sort(msec)	Quick Sort(msec)	Insertion Sort(msec)
787	750	45022362
1757	1911	infinity
2117	2186	infinity
2583	2417	infinity

Time taken to sort elements from array by Merge Sort is less compared to time taken by Quick Sort.

Running time complexity of Insertion Sort is too very much. We can say next to infinity.

Part 2:

Size:8000000

Elements in the array are random

Merge Sort(msec)	Quick Sort(msec)	Insertion Sort(msec)
4869	6746	infinity
6426	8498	infinity
8816	10879	infinity
10391	14129	infinity
15227	18827	infinity

Time taken to sort elements from array by Merge Sort is less compared to time taken by Quick Sort.

Running time is not affected by the number of elements from the array increases.

Running time complexity of Insertion Sort is to very much. We can say next to infinity.

Part 3:

Size:8000000

Elements in the array are fixed. Elements are retrieved from the file.

Merge Sort(msec)	Quick Sort(msec)	Insertion Sort(msec)
5374	7667	infinity
7688	8296	infinity
8089	9523	infinity
10007	13155	infinity

Time taken to sort elements from array by Merge Sort is less compared to time taken by Quick Sort. Running time is not affected by the number of elements from the array increases neither the elements stored in the array differ randomly.

Running time complexity of Insertion Sort is to very much. We can say next to infinity.

Note: The runtime complexity varies as the elements from the array may be very huge or may be repetitive.

Conclusion: Running time complexity of Merge Sort is always less than Quick Sort.

Merge Sort worst case run time complexity is $O(n \log n)$, for Quick Sort is $O(n^2)$. While for average case and Best case run time complexity is $O(n \log n)$ for both. While run time complexity for Insertion Sort is $O(n^2)$ in average and worst case.

References:

Class notes - Balaji

Introduction of Algorithms - Thomas Cormen, Charles Leiserson, Ronald Rivest , Clifford Stein