ISTANBUL TECHNICAL UNIVERSITY

COMPUTER ENGINEERING DEPARTMENT

BLG 212E

MICROPROCESSOR SYSTEMS
HOMEWORK 2 REPORT

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Contents

1 FORMULA

I have used the formula below to calculate the load value in the homework:

Load = (Clock Frequency / Timer Frequency) - 1

The interrupt frequency has been chosen as 100,000 HZ and the system clock frequency is assumed to be 25 MHz. So, the load value will be:

Load = (25 MHz / 100000 Hz) - 1 = 250 - 1 = 249

2 GRAPH

Times measured for bubble sort and merge sort:

Bubble Sort = [3, 11, 28, 52, 88, 153, 217, 263, 322, 412, 454, 520, 719, 791, 850, 1100, 1261, 1339, 1418, 1497]

Merge Sort = [5, 14, 24, 34, 46, 58, 69, 82, 97, 112, 123, 138, 152, 166, 180, 193, 210, 226, 242, 257]

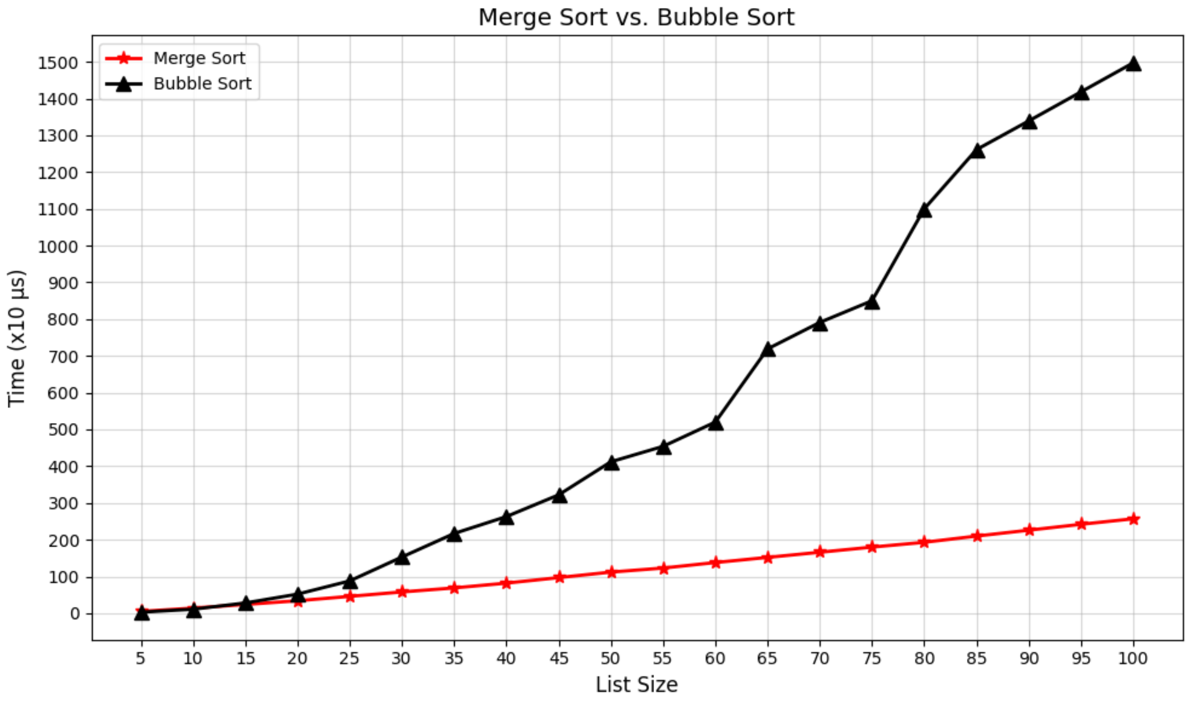

Figure 1: Comparison of performances of Bubble Sort and Merge Sort[1]

It can be observed that Bubble Sort's complexity is significantly higher than Merge Sort. This difference is related to their implementation logic. Bubble Sort is a comparison-based algorithm that has the best time complexity $O(n)$ and worst time complexity $O(n^2)$.

When the input size gets larger and larger, its complexity increases since more comparisons and swaps are required among elements when the list is not ordered. So, it can be said that the Big O complexity of Bubble Sort is $O(n^2)$ here. Merge Sort is a divide-and-conquer algorithm that has the best time complexity $O(nlogn)$ and worst time complexity $O(nlogn)$. Even though the size of the input, its complexity does not change since it first divides the input into two pieces recursively, and then sorts while merging. As can be observed from the graph it has a great advantage when compared to Bubble Sort in large input sizes. So, it can be said that the Big O complexity of Merge Sort is $O(nlogn)$ here. However, when the input size is small, Bubble Sort has more advantages since it only compares and does not divide and conquer. Also, for small datasets the space complexity of Bubble Sort is less than Merge Sort since it does not require additional space like Merge Sort.

REFERENCES

[1] Python Software Foundation. Python. https://www.python.org/.