Program Structures and Algorithms

Spring 2023(SEC –08)

NAME: Priyal Vimal Gudhka

NUID: 002747680

**Assignment-2 3-Sum Problem**

Reason why quadratic methods work is as follows: -

The time complexities of the different algorithm to address the 3-Sum problem is as follows: -

# Time Complexity of solving 3-Sum problem with Cubic Solution is O(N3) as it uses 3 loops and for each iteration the complexity increases by ‘N’

# Time Complexity of solving 3-Sum problem with Quadratic Solution is O(N2) as it uses only 2 loops

# Time Complexity of solving 3-Sum problem with Quadrithmic Solution is O(N² logN) as it uses 3 loops and for each iteration the complexity increases by ‘N’

Referring to the complexities it is evident that to address the 3-Sum problem using Cubic will take much more time than the Quadratic solution. If we solve the 3-Sum problem using Quadrithmic method again the complexity is more compared to the Quadratic as it uses Binary Search to find the index which adds logN to the time complexity.

Below are the Graphs plotted for all the different solutions with varying number of elements:

1. **Raw Time Graph of Cubic Solution**
2. **Raw Time Graph of Quadrithmic Solution**
3. **Raw Time Graph of Quadratic Solution**
4. **Raw Time Graph of QuadraticWithCaliper Solution**
5. **Raw Time Graph comparing all the above-mentioned Solutions**

Below is the screenshot of all the unit tests:

Text

Description automatically generated