Program Structure And Algorithm

Assignment – 2

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| --- | --- | --- | --- | --- |
| N | ThreeSumQuadratic  (ms) | ThreeSumQuadrithmic  (ms) | ThreeSumCubic(ms) | ThreeSumQuadraticWithCalipers  (ms) |
| 250 | 7.0 | 7.0 | 21.0 | 2.0 |
| 500 | 9.0 | 6.0 | 29.0 | 5.0 |
| 1000 | 13.0 | 19.0 | 214.0 | 8.0 |
| 2000 | 33.0 | 97.0 | 1424.0 | 127.0 |
| 4000 | 222.0 | 317.0 | 10594.0 | 384.0 |
| 8000 | 454.0 | 1245.0 | 162.0 | 486.0 |
| 16000 | 1951.0 | 5524.0 | 72.0 | 1642.0 |

Brief explanation of why the quadratic method(s) work:

The term "quadratic method" describes a class of algorithms with an O(n2) time complexity, where n is the total number of elements in the input dataset. Because the time required to run these algorithms grows exponentially with the square of the size of the input dataset, they are referred regarded as "quadratic" algorithms.

The nested loop structure used by the quadratic approach is what makes it effective. Every element in the input dataset is iterated through in the outer loop, while the inner loop iterates over every other element in the dataset for each element. As a result, every element in the dataset is compared to each other element, which is an O(n2) operation.

For instance, the nested loop structure is employed in the ThreeSumQuadratic method. To determine whether the sum of any two elements in the input dataset equals the value of the third element by comparing each element in the input dataset to every other element in the dataset.

Although quadratic algorithms are effective for small input datasets, they lose effectiveness as the dataset size grows. This is due to the fact that the algorithm's execution time grows linearly with the square of the input dataset's size. Alternative methods with better temporal complexity, such as the ThreeSumCubic, which has an O(n2 log n) complexity, may therefore be more appropriate for huge datasets.

Text

Description automatically generated