Optional Assignment : Fuzzy Interval Sort

Due date: 03.19.2019

Result Analysis:

Fuzzy Sort:

Test case 1:

5, 7

1, 3

4, 6

8, 10

```
Before the sorting:
5, 7
1, 3
4, 6
8, 10
After the sorting:
1, 3
4, 6
5, 7
8, 10


Total time taken for Execution: 370120
```

Test case 2:

6, 7
9, 11
13, 14
3, 7
11, 15
13, 14

12, 14
14, 15
9, 15
5, 7
7, 9
1, 5
1, 9
6, 10

Output:

```
Before the sorting:
6, 7
9, 11
13, 14
3, 7
11, 15
13, 14
12, 14
14, 15
9, 15
5, 7
7, 9
1, 5
1, 9
6, 10
After the sorting:
1, 5
5, 7
6, 7
3, 7
7, 9
6, 10
1, 9
9, 11
9, 15
11, 15
13, 14
13, 14
12, 14
14, 15


Total time taken for Execution: 365494
```

Quicksort:

Test case 1:

5, 7

1, 3

4, 6

8, 10

```
Before the sorting:
5, 7
1, 3
4, 6
8, 10
After the sorting:
1, 3
4, 6
5, 7
8, 10


Total time taken for Execution: 812723
```

Test case 2:

6, 7
9, 11
13, 14
3, 7
11, 15
13, 14
12, 14
14, 15
9, 15
5, 7
7, 9
1, 5
1, 9
6, 10

Output:

```
Before the sorting:
6, 7
9, 11
13, 14
3, 7
11, 15
13, 14
12, 14
14, 15
9, 15
5, 7
7, 9
1, 5
1, 9
6, 10
After the sorting:
1, 5
1, 9
3, 7
5, 7
6, 7
6, 10
7, 9
9, 11
9, 15
11, 15
12, 14
13, 14
13, 14
14, 15


Total time taken for Execution: 1490763
```

Conclusion:

When the execution time (in nanoseconds) was compared for fuzzy sorting and quicksort, it was observed that for the same input size, fuzzy sort works faster than quicksort (provided input instances are not disjoint).

Time complexity analysis:

Fuzzy Sort:

When input instances are disjoint, the worst case time complexity is O(nlogn).

When input instances overlap at one point, then the worst case time complexity reduces to less than O(nlogn) which is O(n).

Quicksort

Worst case time complexity of quicksort is O(nlogn).

However, if all input instances are the same numbers, then the worst case time complexity of quicksort tends to be O(n^2).

References/Citation:

[1] For time compexity analysis

https://stackoverflow.com/questions/45779963/randomized-quick-sort-worst-case-time-complexity

[2] Randomized Quicksort

https://www.geeksforgeeks.org/quicksort-using-random-pivoting/