

Name : MANISH JAYSWAL

S.R. No. : 18844

Subject : Assignment#1 - DS 221

#Analysis of results

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manish@manish-OMEN-Laptop-15-ek0xxx:~/ds221-2020/a1/q2$ ./TreeSearch num1.txt query1.txt
A2a:5,86683,2851
A2c:1917
manish@manish-OMEN-Laptop-15-ek0xxx:~/ds221-2020/a1/q2$ ./TreeSearch num1.txt query1.txt
A2a:5,30327,938
A2c:523
manish@manish-OMEN-Laptop-15-ek0xxx:~/ds221-2020/a1/q2$ ./TreeSearch num1.txt query1.txt
A2a:5,86713,2819
A2c:1806
manish@manish-OMEN-Laptop-15-ek0xxx:~/ds221-2020/a1/q2$ ./TreeSearch num2.txt query2.txt
A2a:68,1590842,63027
A2c:31231
manish@manish-OMEN-Laptop-15-ek0xxx:~/ds221-2020/a1/q2$ ./TreeSearch num2.txt query2.txt
A2a:68,1550594,61989
A2c:28175
manish@manish-OMEN-Laptop-15-ek0xxx:~/ds221-2020/a1/q2$ ./TreeSearch num2.txt query2.txt
A2a:68,1547330,62386
A2c:28889
manish@manish-OMEN-Laptop-15-ek0xxx:~/ds221-2020/a1/q2$ ./TreeSearch num3.txt query3.txt
A2a:277,8574799,271774
A2c:38438
manish@manish-OMEN-Laptop-15-ek0xxx:~/ds221-2020/a1/q2$ ./TreeSearch num3.txt query3.txt
A2a:277,8221952,263014
A2c:35147
manish@manish-OMEN-Laptop-15-ek0xxx:~/ds221-2020/a1/q2$ ./TreeSearch num3.txt query3.txt
A2a:277,8495766,299054
A2c:36130
manish@manish-OMEN-Laptop-15-ek0xxx:~/ds221-2020/a1/q2$ █
```

Ln 66, Col 11

Figure(i)

Q2(a):

Space Complexity for in order traversal : $O(\log n)$; n being number of entries in the tree

Space complexity for level order traversal : $O(1)$

Expected Time Complexities for In Order and Level Order should be the same. The time taken to perform these operations increased as inputs to query increased.

For increase in search elements from 5 to 99 (i.e. increasing numbers by 20 times) time has increased from approximately 50,000 to 1,000,000 (that is ~ 20 times). For 99 to 366(~3.5 times), the time has increased like (~10 times).

So it has to be $O(n)$ time complexity to have this effect which is true. Because, both implementations go through the elements until it finds query number. In the worst case, (that is negative result = number not found) it goes through all elements of the tree.

Therefore, $O(n)$ time complexity.

The in order traversals uses stack and level order uses queue in its implementation to have same order.

Q2(c):

We can see from figure(i), in all the test cases, the time taken by binary search is always less than the time taken by searching using in-order traversal and level order traversal. Because the time complexity of binary search is of $O(\log n)$.