CMPT-225 Assignment-3 Report

1. 3 randomly generated keys were inserted initially in the tree.
2. After that, ‘n’ number of keys were inserted, searched for and removed from the tree respectively. This brings the total number of operations to 3n. The keys that were inserted and searched for was generated in an order from 101 to n.
3. The height, size and average node depth was recorded after insertion, and searching operation. However, time was recorded as in time required for executing all of these 3n operations.
4. The data plot observed is given in Fig. 1.1.

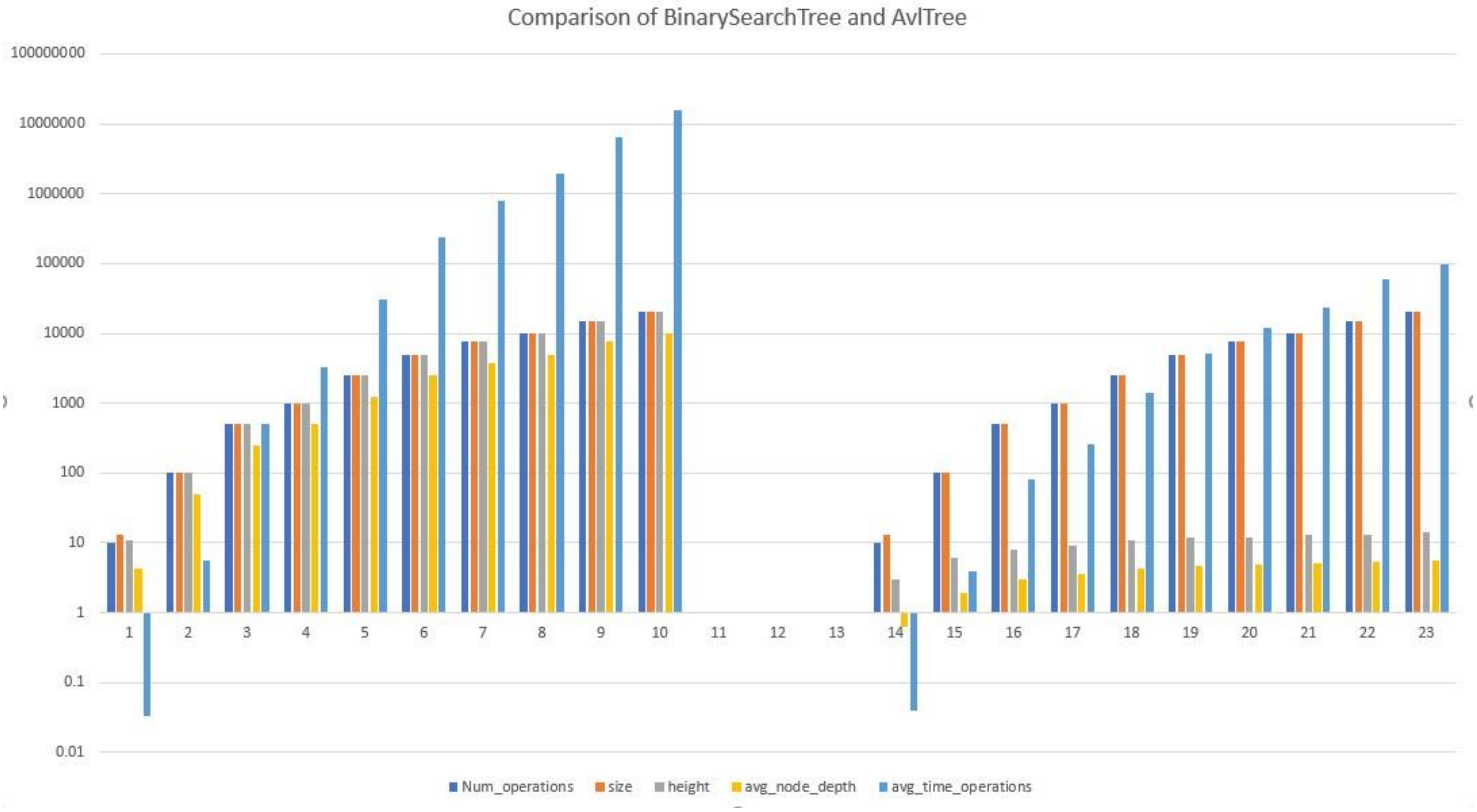

Fig. 1.1 Comparison between BinarySearchTree and AvlTree. The 1st graph (left side) is the BinarySearchTree and the 2nd graph (right side) is of AvlTree.

Note: The y-axis is logarithmically scaled to make the bars comparable to human eye.

OBSERVATIONS

- The number of keys inserted in trees were same, which gives us the same size for both, but the height and average node depth is significantly different.
- The difference in the average node depth and height explains the difference in the amount of time taken to execute the functions.
- We found out that the plot between average time taken to execute operations and the size of the trees is exponential.

Submission Files:

- **tree_tester.cpp:** contains the main and produce the required csv files.
- **stat_bst.csv:** csv file containing the statistics for binary search tree.
- **stat_avl.csv:** csv file containing the statistics for avl tree.
- **Tree-experiments.xls:** excel file containing data in tables and plots required to reach conclusion/ observations.
- **Readme**: clear instructions on how to run the program.

Data for Binary Search Tree:

S. no.	Num_operations	size	height	avg_node_depth	avg_time_operations
1	10	13	11	4.23077	0.0333333
2	100	103	101	49.0291	5.53333
3	500	503	501	249.006	509.167
4	1000	1003	1001	499.003	3283
5	2500	2503	2501	1.25E+03	30906.7
6	5000	5003	5001	2.50E+03	237565
7	7500	7503	7501	3.75E+03	788440
8	10000	10003	10001	5.00E+03	1.89E+06
9	15000	15003	15001	7.50E+03	6.53E+06
10	20000	20003	20001	1.00E+04	1.57E+07

Data for Avl Tree:

S. no.	Num_operations	size	height	avg_node_depth	avg_time_operations
1	10	13	3	0.615385	0.04
2	100	103	6	1.92233	3.96667
3	500	503	8	3.00199	79.3333
4	1000	1003	9	3.49551	262
5	2500	2503	11	4.18458	1404.17
6	5000	5003	12	4.68279	5198.33
7	7500	7503	12	4.95508	11932.5
8	10000	10003	13	5.18185	23430
9	15000	15003	13	5.45451	59765
10	20000	20003	14	5.68135	97333.3