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INFO 6205
Program Structures & Algorithms
Assignment 5 – Li Hua

Objective:

The objective of this experiment to implement a random insertion and deletion method and compare the max depth and average depth of the binary search tree with N*(1/2) and lgN.

Experiment Design:

First, I build Binary Search Tree with HashMap. Each value of the map is randomly generated, and the size of the map is N. Then I implemented an insertion and deletion function. It will run random insertion or deletion for M times.

For each experiment there is from 1000 to 100000 insertions and deletions. I recorded the size of the tree, max depth and average depth for each insertion size, then compared these indexes with lgN and square(N), which is the average time complexity of insertion and deletion for BST. Please check the Excel file for detailed dataset.

Conclusion:

The following chart shows how Average Depth and Max Depth changed with N. As we can see, the values of Depth are between lg N and N^1/2, and proportional to sqrt of N rather than lg N. However, as the values of N become larger, the increase of depth is much slower than N^1/2.

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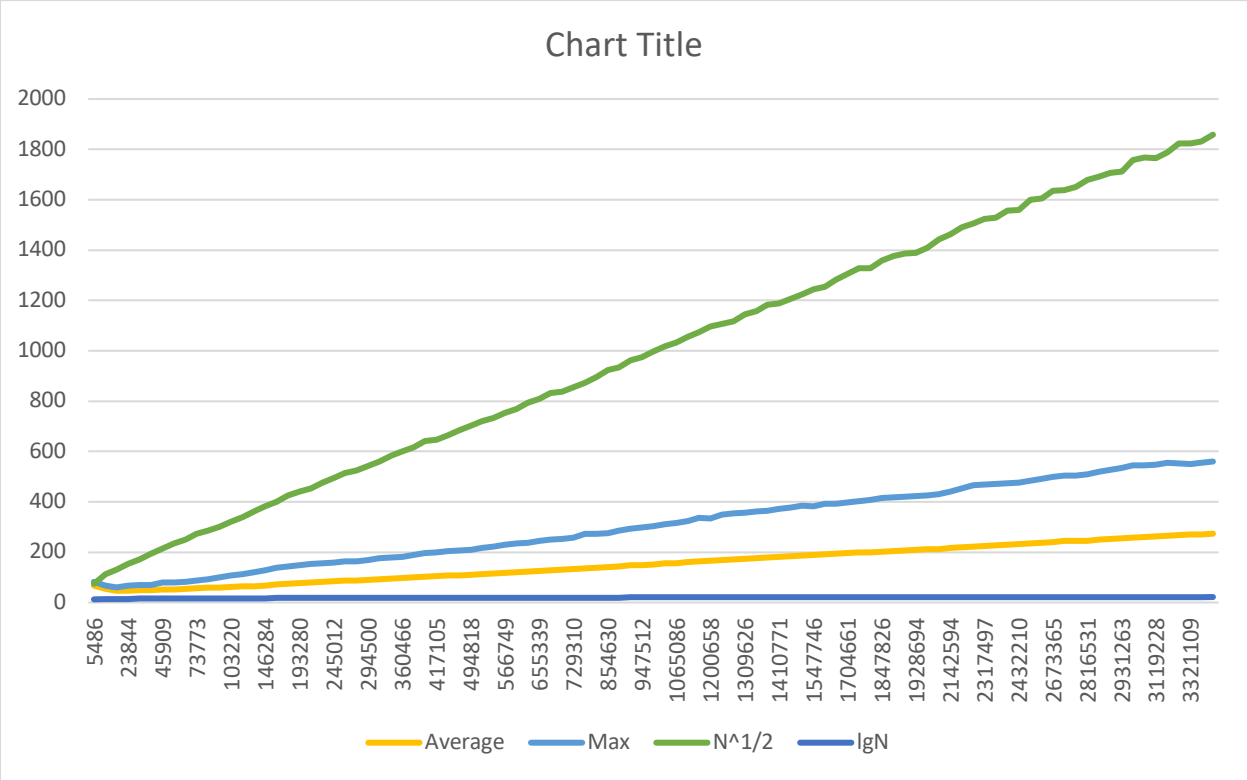

```
 T E S T S
-------------------------------------------------------
Running edu.neu.coe.info6205.symbolTable.BSTTest
Y: 42
  smaller:   X: 99
  larger:   Z: 37

Hello: 3
  smaller:   Goodbye: 5
    smaller:     Ciao: 8

Hello: 3
  smaller:   Ciao: 6
    larger:     Goodbye: 5

X: 42

Y: 52
  smaller:   X: 42
  larger:   Z: 99

Tests run: 13, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.128 sec

Results :

Tests run: 13, Failures: 0, Errors: 0, Skipped: 0

------------------------------------------------------------------------
BUILD SUCCESS
------------------------------------------------------------------------
```