GTU Department of Computer Engineering
CSE 222/505 - Spring 2021
Homework 7 Report

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1. SYSTEM REQUIREMENTS

1.Software Specification

Operating System : macOS Catalina, Windows 10

Front End : Eclipse, Sublime Text

Rear End : Oracle SQL

Design Tool : UML

2.Hardware Specification

Processor : x86 processor

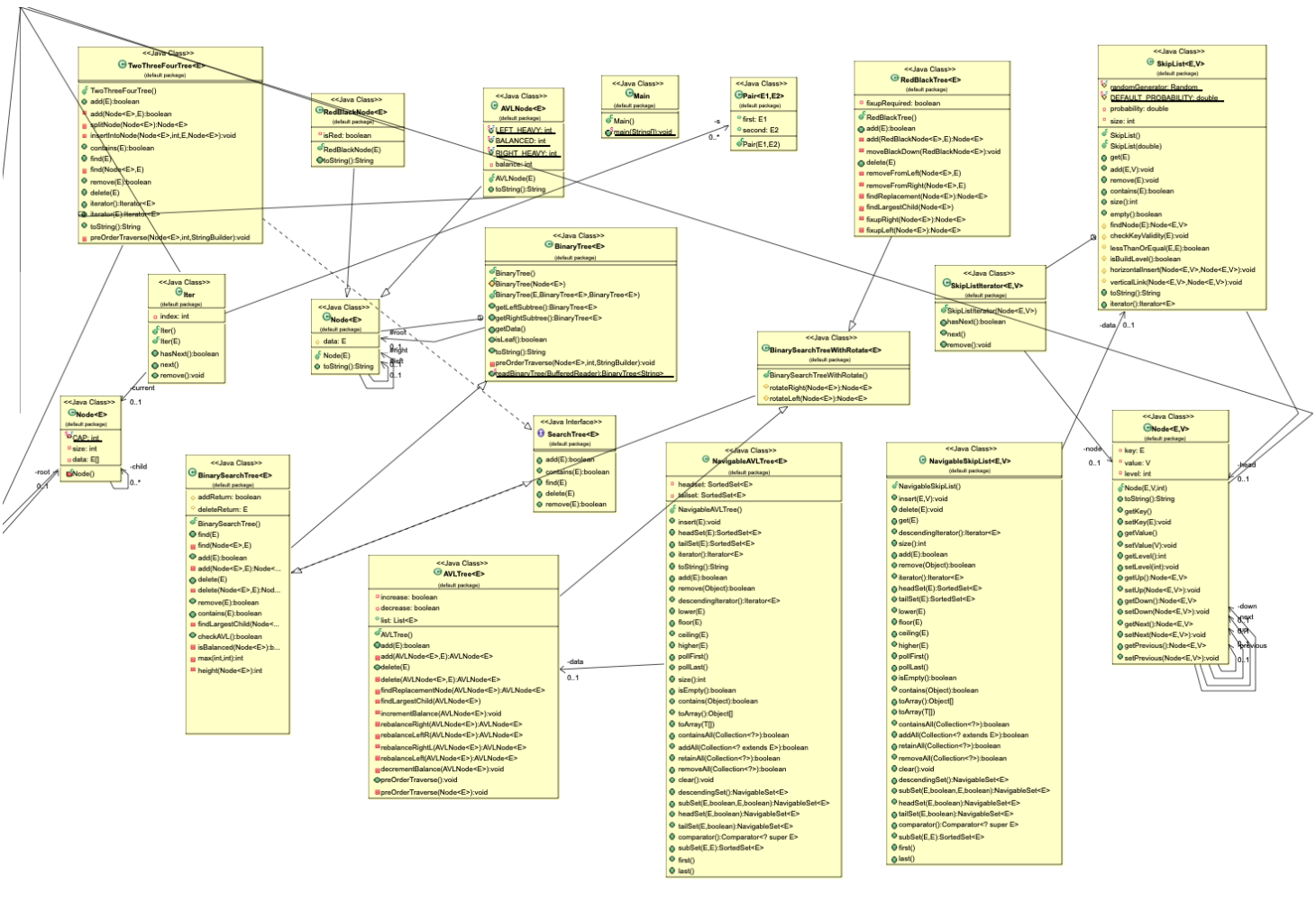
RAM : 512 MB or greater

Hard Disk : 20 GB or greater

3.User Characteristics

Every user; should have basic knowledge of English.

2. CLASS DIAGRAM



3. PROBLEM SOLUTION APPROACH

In this assignment, We were expected to perform tasks using structures such as AVL Tree, Red Black Tree etc. So I started assignment by researching these data structures in detail. I especially focused on the SkipList structure, which is not implemented in the book.

I used the existing methods of the structures to implement the desired data structures from the NavigableSet interface.

It was necessary to work with recursive functions when checking whether the BST structure is a balanced or not.

Finally, by measuring the running performance of the structures, I listed the different cases and completed the last part.

4. RUNNING AND RESULTS

```
---------- NavigableAVLTree ------------
----------------------------------------
- 5,3,8,10,33 are added to NavigableAVLTree.

- NavigableAVLTree Iterator created.

- NavigableAVLTree Iterator called 5 time :

3 5 8 10 33

- headSet method performed(toElement = 6):  [3, 5]
- tailSet method performed(fromElement = 7):  [8, 10, 33]
```

```
---------- NavigableSkipList ------------
-----------------------------------------
- 5,8,10 are added to NavigableSkipList.

- NavigableSkipList Iterator created.

- NavigableSkipList Iterator called 3 time :

Level 1 : 6
Level 2 : 8
Level 3 : 10

Size: 3

Level 2 and Level 3 deleted :

Level 1 : 6

Size: 1
```

```
---------- BinarySearchTree Check(AVL or Not) ------------
----------------------------------------------------------
- 15,5,20,23,4,6 are added to bst1(AVL Tree).

        - BST's recursive checkAVL method called.
        - Check = True

- 1,2,3,4,5, are added to bst2(Not AVL Tree).

        - BST's recursive checkAVL method called.
        - Check = False
```

```
----------Average Running Times----------
-----------------------------------------

10000 number:

BinarySearchTree : 4364825
AVLTree : 10494319
RedBlackTree : 15205383
TwoThreeFourTree : 10693079

20000 number:

BinarySearchTree : 5797214
AVLTree : 6909992
RedBlackTree : 7232247
TwoThreeFourTree : 9897351

40000 number:

BinarySearchTree : 5995571
AVLTree : 10175136
RedBlackTree : 11214112
TwoThreeFourTree : 7704400

80000 number:

BinarySearchTree : 9501118
AVLTree : 17117940
RedBlackTree : 20938927
TwoThreeFourTree : 15639928
```