Name: Ramovha Lasy

Student number: RMVLAS001

Binary Search Tree and traditional Unsorted Array comparison Report

Experiment Aim

The aim of the experiment is to find out the difference in search speed between Binary Search Tree and traditional Arrays. The experiment is conducted by calculating how many comparisons it take for given data to be found in the two data structure that are being compared namely Binary Search Tree and traditional Array. The dataset is sectioned into subsets and we calculate the best, worst and average instrumentation for the subset using the two methods we are comparing, we then table the results.

The OO design

Three classes are created AccessArrayApp, AccessBSTApp and Student. The student class contains all the methods that are used by the AccessArrayApp class and the AccessBSTApp class. The methods created in the student class are then called in each suitable class. In the AccessArrayApp class the main function and an object of type Student Class is created we then use the object to call the methods from Student class, the same applies for the AccessBSTApp class the only difference being that instead of reading and storing data in the array created in student class the data for AccesBSTApp is inserted into a binary tree node to create a tree. The BinaryTreeSearch is implemented using three classes namely BinaryTreeNode, BinaryTree and BinarySearchTree. The preOrder algorithm was used to print all students in the AccessBSTApp.

RESULTS

Part 1:

AccessArrayApp

Test0: Invalid Student ID

```
Access Denied!
The instrumentaion count for Array is: 5000
```

Test1: Valid Student ID

```
Student number: MLLNOA014
student name: Noah Maluleke
The instrumentaion count for Array is: 1
```

Test2: Valid Student ID

```
Student number: MHLEMI021
student name: Emihle Mahlangu
The instrumentaion count for Array is: 128
```

Test3: Valid Student ID

```
Student number: KHMJUN007
student name: Junior Khumalo
The instrumentaion count for Array is: 3434
```

Test4: No parameter (first five)

```
Student Number: MLLNOA014
Student Name: Noah Maluleke

Student Number: WTBJAY001
Student Name: Jayden Witbooi

Student Number: KHZOMA010
Student Name: Omaatla Khoza

Student Number: MLTLUK019
Student Name: Luke Malatji

Student Number: NKNTHA021
```

```
Student Name: Thato Nkuna
```

Test4: No parameter (last five)

```
Student Number: MSXROR015
Student Name: Rorisang Mosia

Student Number: DNLAYA006
Student Name: Ayabonga Daniels

Student Number: CHKOFE015
Student Name: Ofentse Chauke

Student Number: MNGREA015
Student Name: Reatlegile Moeng

Student Number: SHBCAL017
Student Name: Caleb Shabangu
```

AccessBSTApp

Test0: Invalid Student ID

```
Access Denied!
The instrumentaion count for BST is: 19
```

Test1: Valid Student ID

```
student number: MGLLET011
student name: Lethabo Mogale

Instrumentation count for BST is: 6
```

Test2: Valid Student ID

```
student number: MHLEMI021
student name: Emihle Mahlangu

Instrumentation count for BST is: 14
```

Test3: Valid Student ID

```
student number: KHMJUN007
student name: Junior Khumalo

Instrumentation count for BST is: 44
```

Test4: No parameter (first five)

```
student number: MLLNOA014
student name: Noah Maluleke

student number: KHZOMA010
student name: Omaatla Khoza

student number: CHKONT018
student name: Onthatile Chauke

student number: BTHAMO046
student name: Amogelang Buthelezi

student number: BLYLET001
student name: Letlotlo Baloyi
```

Test4: No parameter (lastfive)

```
student number: WTBTSH002
student name: Tshegofatso Witbooi
```

student number: WTBTHA010
student name: Thato Witbooi

student number: WTBSIY016
student name: Siyabonga Witbooi

student number: WTBTSH025
student name: Tshegofatso Witbooi

student number: WTBTSH028
student name: Tshegofatso Witbooi

Experiment Results

Table of dataset and instrumentation

Traditional Unsorted Array

Dataset(n)	Best Case	Worst Case	Average Case
500	1	500	250
1000	1	1180	590
2500	1	2499	1249.4
5000	1	5000	2500

Binary Search Tree

Dataset(n)	Best Case	Worst Case	Average Case
500	1	18	9
1000	1	28	14
2500	1	36	18
5000	1	40	20

Discussion of Results

From the results tables is can be clearly observed that the Binary Search Tree performs significantly less instrumentation when searching for data compared to the Traditional Unsorted Array which take more instrumentation. The speed comparison between the two data structures can be drown from the instrumentation in take for each data structure to find the data. We can thus conclude that the Binary Search Tree is more efficient for searching that the Tradition Unsorted Array.

Creativity

The student class created contain all the methods required by the two programmes AccessArrayApp and AccessBSTApp. The number of instrumentation for each search is also printed out in the instrumentation.txt file for both programmes.

Git Usage

```
0: commit 55dab87834e4c7672026e0ef32409eef69524c85
1: Author: lasykunte <lasyramovha53@gmail.com>
2: Date: Thu Apr 8 14:40:49 2021 +0200
3:
4: complete assignment and ready for submission
5:
6: commit a0f8e25fe48e83f6c55bb2eb0b9b0456e2ff61d1
7: Author: lasykunte <lasyramovha53@gmail.com>
8: Date: Wed Apr 7 19:03:30 2021 +0200
9:
10: assignment1 working version 2-
11:
```

```
12: commit eabc4350c173a2da2d558e08d76d3570feb1c938
13: Author: lasykunte <lasyramovha53@gmail.com>
14: Date: Sun Apr 4 23:17:31 2021 +0200
15:
16: working version 1-
17:
18: commit 71a124cd85fd10fb6a9613f01bdf2de0c01fb34e
19: Author: lasykunte <lasyramovha53@gmail.com>
20: Date: Sun Apr 4 09:07:26 2021 +0200
21:
22: saple code for Array and Bst
23:
24: commit 3bd7357939c335a9d12c0e64486b7cec04f5c90d
25: Author: lasykunte <lasyramovha53@gmail.com>
26: Date: Sat Apr 3 20:08:28 2021 +0200
27:
28: assignment temp
29:
30: commit c1a21ca5de13b772b538e2099e403672c486bb04
31: Author: lasykunte <lasyramovha53@gmail.com>
32: Date: Sat Apr 3 14:05:51 2021 +0200
33:
```