CSC2001F: Assignment 1 report 2021

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Binary Search Trees

Data structures

The task of the assignment requires a written code to read a text file containing student information(student identity, student name and last name) and store two entries(student identity and student fullname) such as:
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Part 1 : Programs
Created two application AccessArrayApp and AcessBSTApp to store and retrieve data from text file oklist, each application contains two definite methods namely, printAllStudent which outputs every entry of inside data and printStudent which outputs entry by specific key.

AccessArrayApp
Contain class AccessArrayApp.

- **-Which has ArrayList oklist to store oklist entries.**
- **-4 methods:**
  - **-readAndstore which contains the scanner to iterate over oklist and store the entries.**
  - **-main method to create object of class and invoke methods .**
  - **-printAllStudent which output every data entry of the arrayList oklist from the text file oklist.**
  - **-printStudent takes in a key which is the identity of the student as type String and output a specific data entry by comparing all keys in the arraylist oklist and output the match as student student Full name.**

AccessBSTApp
Contains two classess the main class AccessBSTApp and Node
AccessBSTApp class

- **Which includes six methods:**
  -writeToile which use the FileWriter object to write the number of count operations.
- **countFile creates file to store the results of the operations counted.**
- **printAllstudent which output every data entry of the Node currentNode from the text file oklist by an in order traversal.**
- **printStudent takes in a key which is the identity of the student identity as type String and output a specific data entry by student identity and student Full name.**
  -main to read the text file to the Node object, and create object of class AccessBSTApp and invoke methods .

Class Node

Defines a constructor of Node to take student Id and name.

A to string method to printout desired outputs.

Part 2 : Experiment and testing

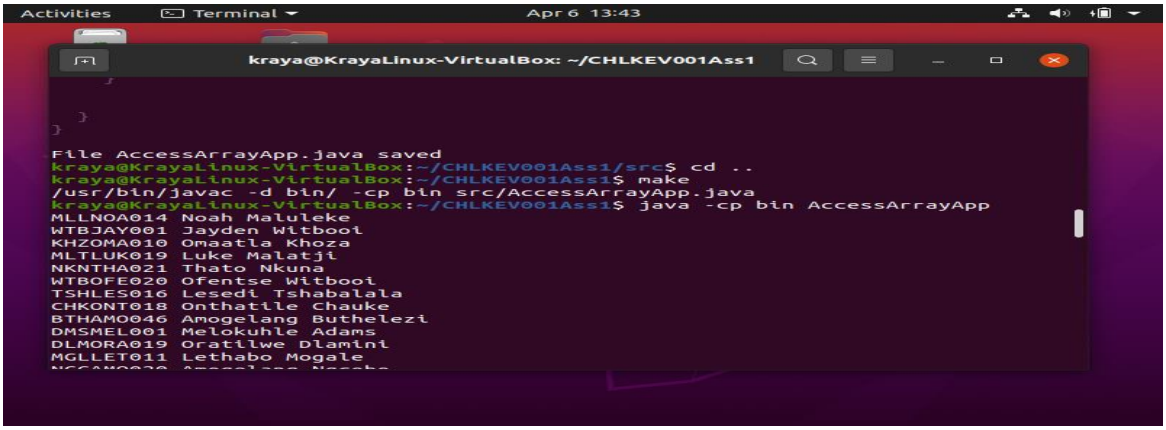
The main objective of the assignment was to compare two data structures, linear search and binary search and conclude which one is efficient judged by the speed differences, both Apps, AccessArrayApp representing linear search and AceessBSTApp representing binary search contains variables inside the source codes to count the number of operation counts and storing the results.

Testing each application with 3 known parameters that work and 3 invalid parameters and without any parameters.

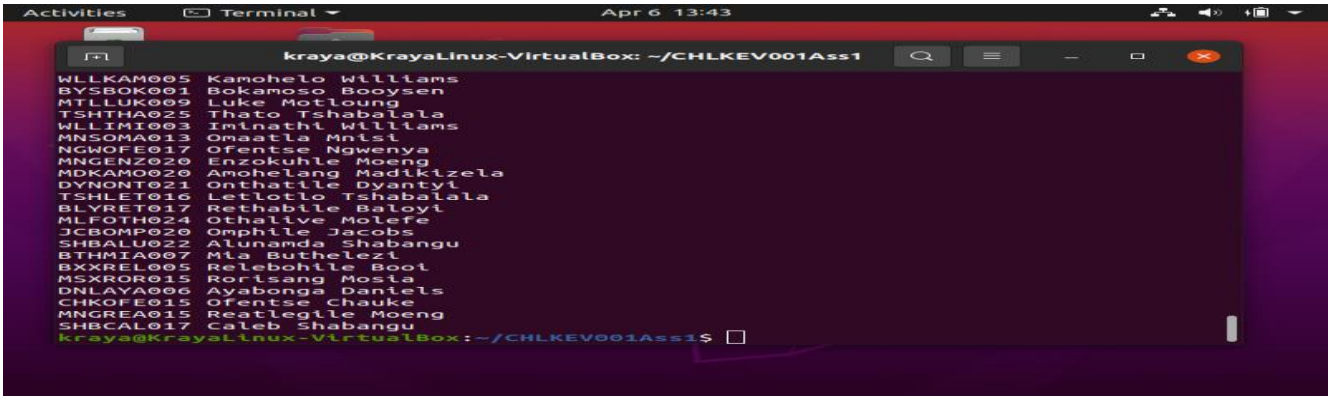
Following are snippets of the code running by testing values :

-AccessArrayApp

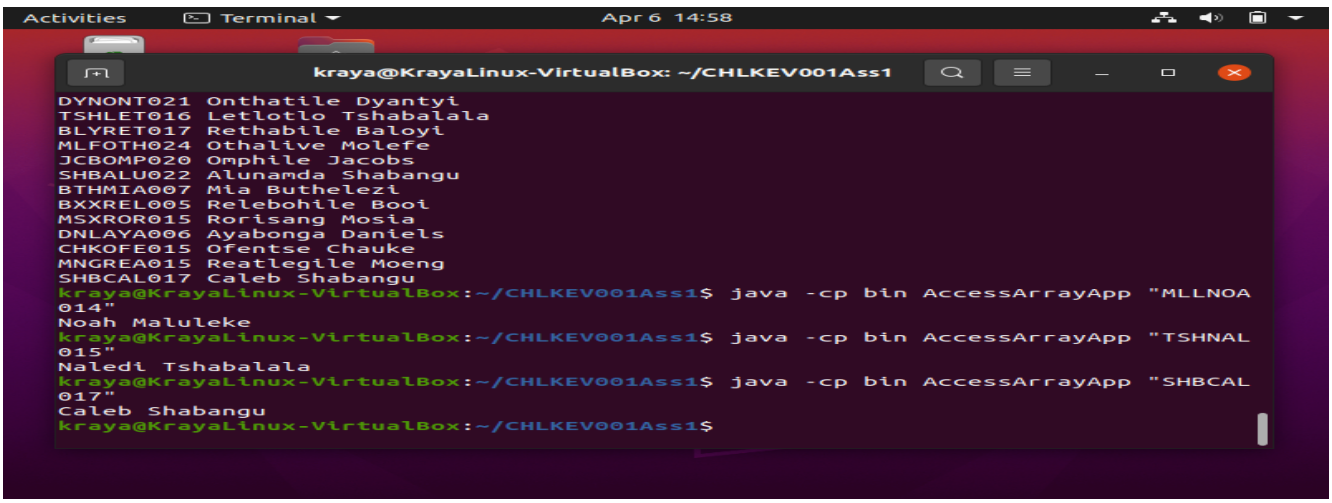
First five for printAllStudent



Last five for printAllStudent



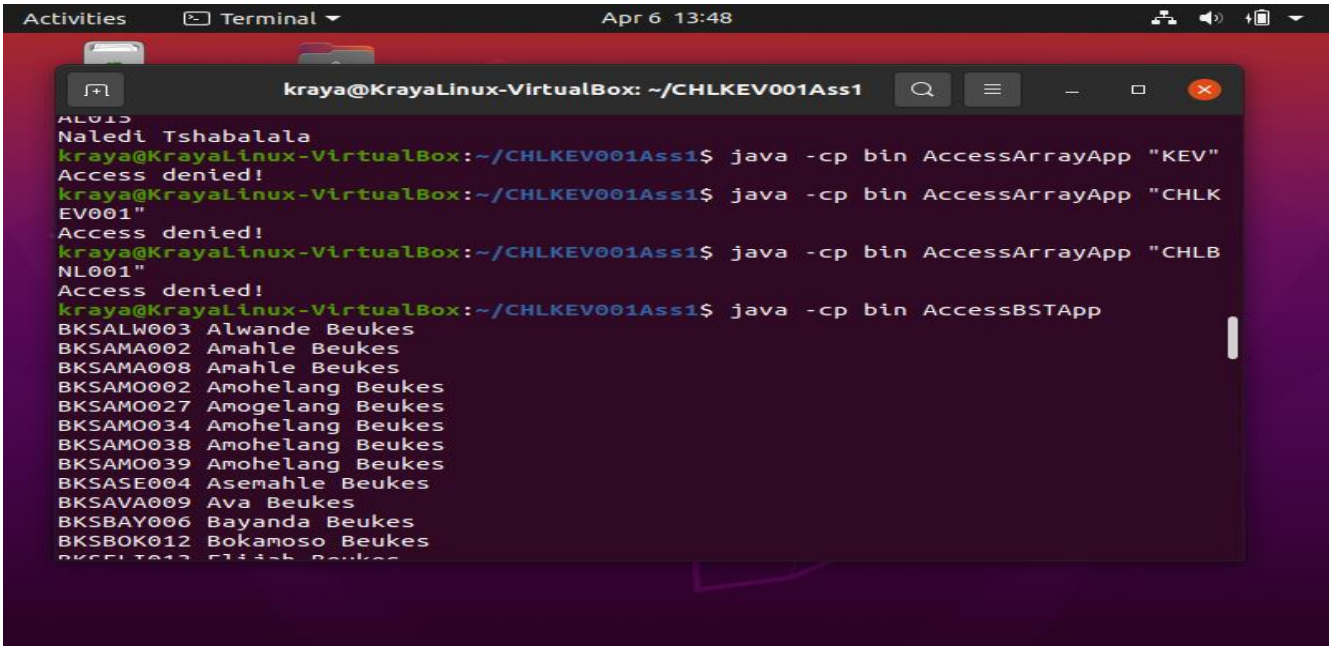
printStudent **3 valid inputs**



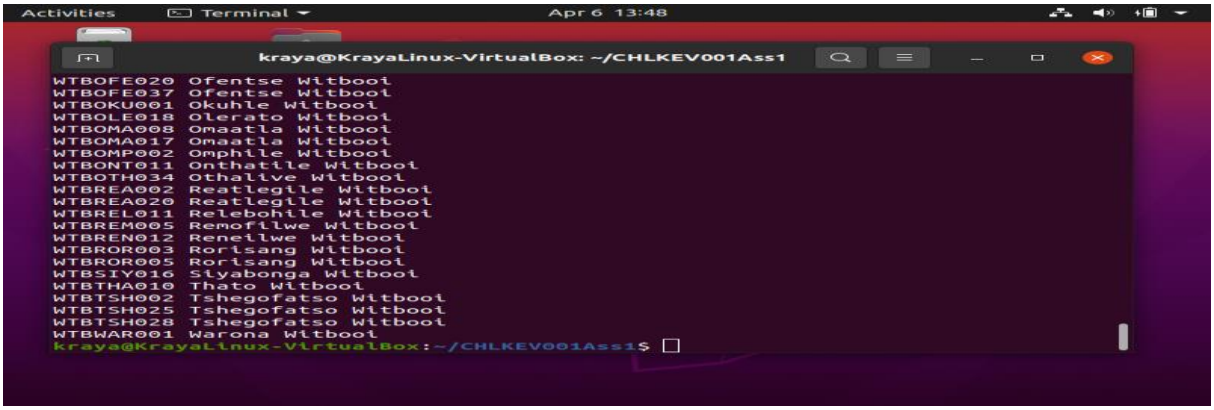
3 invalid inputs

-AccessBSTApp

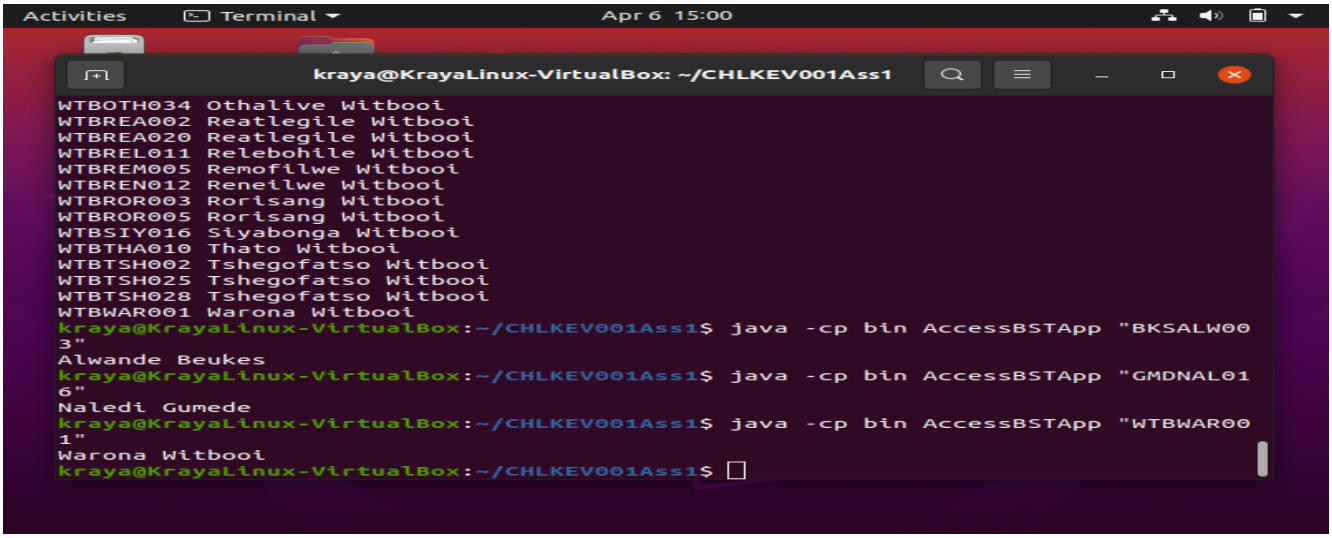
First five printallStudent



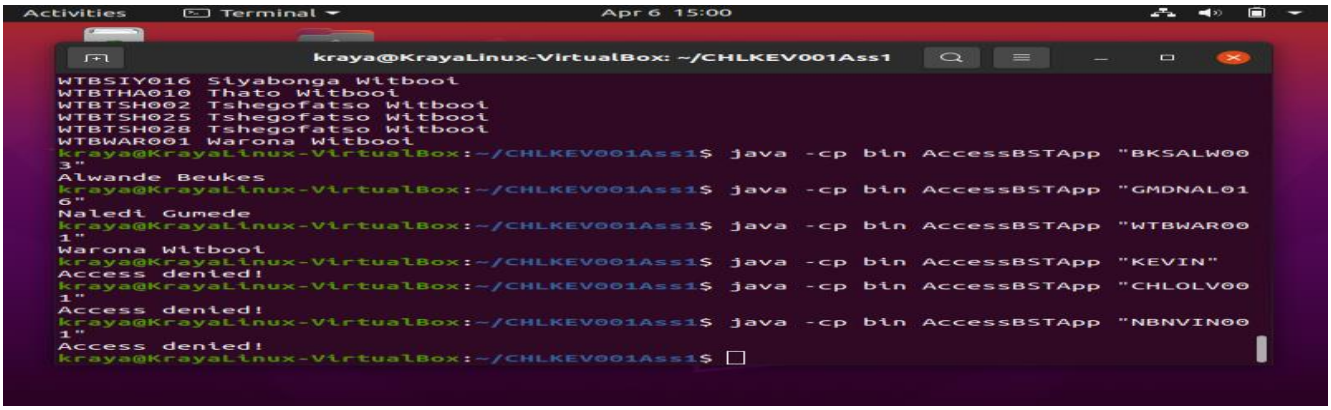
Last five printAllstudent



printStudent 3 valid inputs



3 invalid inputs



Results

The AccessArrayApp best case 0(1) time when the key is at the top of the list, average case0(n)time when the key is at the middle of list and worst0(n)time case when the key is at end of the list.
The AccessBSTApp all operation run in 0(logn) time.
The binary search tree algorithm is more time efficient as it can run all operation with a constant fast time complexity compared to linear search algorithm with it best case slightly slower than the binary search worst case.

Git log