Programming Assignment 4 Report

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Problem Description:

This assignment was to implement and demontrate the use of a binary search tree and study their ability to reduce average search costs for different data sets

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Purpose of the Assignment:

The purpose of the assignment was to demonstrate a knowledge of both the implementation and the application of binary search trees and algorithms that involve binary search trees.

Data Structures Description:

By doing this assignment i learned about the Binary search tree and Binary node data structures. I implemented them in C++ using pointers to link each binary node together in a hierarchical nodes starting with a root node. This allows for more efficient searching when accessing data due to an ideal log(n) height when balanced correctly. The nodes in this implementation also keep track of their own search costs, which are recalculated at each insertion and deletion by the calcdepth() function, which uses inorder traversal to assign each node a depth value. Total cost is calculated during printing of the list. Average search cost is computed by taking the total cost / the size of the tree.

Algorithm Description:

The main algorithms used in this program were in order traversal to print and keep track of the size of the generated tree, another important algorithm used in my implementation is the breadth-first alogorithm, which was used to print the tree level by level.

Program Organization:

The declarations for the binary search tree and binary node are stored in BinarySearchTree.h, while the implementation for most of their functions is stored in BinarySearchTree.cpp, The entirety of the testing and user interface is done in the main.cpp file. BinarySearchTree is a friend class of BinaryNode and uses it as an integral part of it's implementation. BinarySearchTree is also responsible for finding and assigning each BinaryNode a searchCost value.

How to compile + run my program:

(1) type "make all" to compile (2) type "./Main" to run (3) type in the location of the file you want to read in from then press enter (4) type yes/y to remove a node and reprint, type anything else to exit.

Average Search costs:

Perfect = O(nlog(n)), Individual = O(log(n))
Linear = O(n^2), Individual = O(n)

Experimental Results:

Located in testruns.txt and A4-Charts+Data.xls