CSC 228 Data Structures and Algorithms, Spring 2020
Instructor: Dr. Natarajan Meghanathan

Assignment 11: Setting the Data for the Nodes in a Binary Tree to Satisfy the Property of a Binary Search Tree without Changing the Structure of the Binary Tree

Due by: April 9th, 11.59 PM

In this programming assignment, you will set the data for the nodes in a given binary tree in such a way that the binary tree satisfies the data-related property of a binary search tree and at the same time the structure of the binary tree is preserved.

You are given the code for constructing a binary tree whose structure information is passed through a text file and the number of nodes is input by the user. You also input the maximum data value for a node (the data for the nodes could range anywhere from 1 to the maximum data value input by the user). The main function is already written for you. You could notice in the main function that after the binary tree is constructed based on the text file input, a random array of integers (in the range of 1 to the maximum data value) is generated and is sorted using the selection sort algorithm. The sorted array is passed as the argument for the *PrintInorderTraversal*(...) function, which in turn calls the recursive *InOrderTraversal*(...) function whose arguments are the node id to be traversed and the sorted data array, as shown in the code provided.

As part of the Inorder traversal, you will set the data for the visited node using the sorted data array as well as print the same. You need to keep track of the order in which the nodes are visited using a **global variable** whose value can be set/altered in any of the functions in your program. **As a clue for where all you would need to add/extend the code, I have placed the comments** *// Extend the code here as needed* or *// Extend the code for this function here as needed* at a total of three locations in the entire code. You just need to add appropriate statement(s) at each of these locations to accomplish what is needed. After setting the data for the nodes in the binary tree using the in order traversal process, the main function will print the data for the nodes in the binary tree.

As part of your report, you will draw the binary tree corresponding to the given text file. Clearly indicate the node ids outside the circles for the nodes. Then, using the output of your code, fill up the circles of the nodes of the binary tree with the data printed for the nodes. You could cross-check the correctness of your code by checking whether the binary tree with the data satisfies the property for a binary search tree.

Submission (in Canvas)

1) Submit the entire code as a .cpp file
2) Submit a PDF file featuring the following
    a) Screenshot of the output printed by your code
    b) The binary tree (with the node ids indicated outside the circles) corresponding to the given text file along with the data for the nodes (indicated inside the circles) based on the output printed by the code.