

## CENG 202 PROGRAMMING ASSIGNMENT 1 (Trees)

In this assignment, you will use the famous binary search trees as discussed in class. The objective of this assignment is to understand the properties of these trees and get familiar with their implementations. The goal of this assignment is to visualize the populated trees.

Your program will get the input as a file and populate the corresponding binary search, red black, AVL tree and the splay trees using the libtree library. After all operations are done successfully, each instance corresponding to these trees will be visualized as dot files. The total time for the creation of the trees will be reported for each instance in seconds (file access time should be excluded in the timing).

### Input file:

The input file will be composed of statements listed consecutively such as

*operation\_identifier key.*

- Find: f (e.g., f 11)
- Insertion: i (e.g., i 11)
- Deletion: d (e.g., d 11)

For example,

i 1 i 2 i 3 i 4 i 5 f 2 i 6 d 3

### Output:

|           |        |
|-----------|--------|
| BSTree    | x.xxxx |
| RBTree    | x.xxxx |
| AVLTree   | x.xxxx |
| SplayTree | x.xxxx |

### Submission:

In order to include the source files and link the corresponding libraries, put the libtree and GraphViz into your project directory and add these additional paths to your project properties.

You will only submit your source files as a zip file named PA1-StudentID.zip

## REFERENCES

### Tree Libraries

- Libtree: binary search, red-black, AVL, and splay tree implementations in C <https://github.com/fbuihuu/libtree>

### GraphViz <http://www.graphviz.org/Home.php>

- An introduction to GraphViz <http://www.linuxjournal.com/article/7275>
- Visualizing binary trees with Graphviz <http://eli.thegreenplace.net/2009/11/23/visualizing-binary-trees-with-graphviz>
- Visualizing a binary search tree using Graphviz <https://devjeetr.wordpress.com/2012/04/30/visualising-a-binary-search-tree-using-graphviz/>
- How to generate a binary tree and visualize it with Graphviz <http://c0de-x.com/how-to-generate-a-binary-tree-and-visualize-it-with-graphviz/>

### Supplementary resources

- Binary Trees by Nick Parlante <http://cslibrary.stanford.edu/110/BinaryTrees.html>
- Benchmark of dictionary structures <http://lh3lh3.users.sourceforge.net/udb.shtml>