PROGRAM 9 / CSC1310

AVL (BALANCED) TREES



Image credit: https://www.quora.com/What-is-the-Krabby-Patty-secret-formula (modified by me on memgenerator.net)

IMPORTANT DATES

Assignment Date: Monday, April 16, 2018 **Due Date:** Monday, April 23, 2018

PROGRAM ASSIGNMENT DESCRIPTION

Take program 8 and make sure the Binary Search Tree is always balanced (is an AVL Tree). You basically will be adding several private functions to your BinaryTree class. Also, display the tree horizonally.

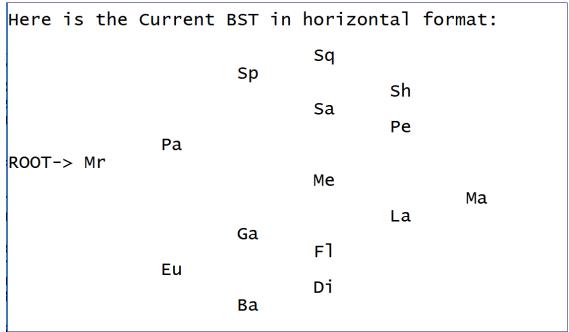
FILES THAT SHOULD BE INCLUDED IN YOUR SUBMISSION

- BinaryTree.h
- BinaryTree.cpp
- KrustyKrab.cpp (driver)
- Makefile
- runProgram.bat
- TEST_CASE.txt

BINARY TREE CLASS

ADD THE FOLLOWING FUNCTIONS TO THE BINARYTREE CLASS:

- balance() balance the tree into an avl tree
- height() find the height of a BST node and return it from this function
- diff() find the height difference between the left & right subtrees of a given node and return it from this function
- Create a function for each possible rotation:
 - o **rr_rotation** perform right-right rotation on a given parent node
 - o **II_rotation** performs left-left rotation on a given parent node
 - o Ir rotation performs left-right rotation on a given parent node
 - o rl_rotation performs right-left rotation on a given parent node
- **display()** this function will display a HORIZONTAL view of the tree's customer names (this must be a public function). Notice that it isn't the full name it is just the first two characters of the names.



MODIFY THE FOLLOWING FUNCTIONS IN THE BINARYTREE CLASS:

• insert() – the insert function should call the balance function

REMOVE THE FOLLOWING FUNCTIONS

- delete()
- deleteNode()
- makeDeletion()

KRUSTYKRAB.CPP (DRIVER)

CHANGE #2 in the menu (which was to remove a customer's data) to read, "Display the Balanced BST horizontally." Then, call the **display()** binary search tree function if the user chooses this option.

Welcome to the Krusty Krab!
Choose one of the following options:

1. Enter customer data.

2. Display the Balanced BST horizontally.

3. Get statistics on Krabby Patties.

4. Search for a customer's data.

5. End Program.
ENTER 1-5:

READABILITY OF OUTPUT & CODE DOCUMENTATION

- Make sure that your output looks similar to my sample output (below). When I run your program, it shouldn't make me want to scream. It should be extremely readable and user-friendly.
- For this program, don't worry about comments except put your NAME at the top of all files that you modify!!!

WHAT TO TURN IN

Zip ALL the files required to compile & run the program, in a single zipped file named whatever you want.

Then, upload this zip file to the assignment folder in ilearn. I will remove one point if you turn in unzipped files. Programs that do not include all the files listed in the "FILES" section above will not be graded.



Image credit: https://funnyjunk.com/Well+technology+has+reached+its+peak/funny-pictures/5353506/23

SAMPLE OUTPUT

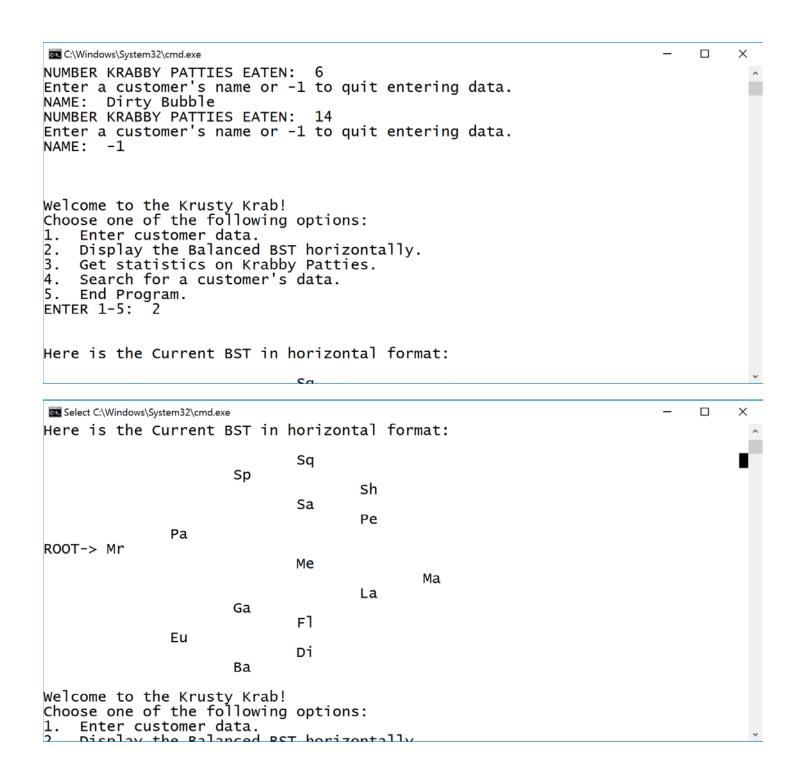
NUMBER KRABBY PATTIES EATEN:

Man Ray

NAME:

Enter a customer's name or -1 to quit entering data.

C:\Windows\System32\cmd.exe C:\Users\acrockett\Desktop\CSC1310 Spring 2018\PROGRAMS\PROGRAM 9\solution>Kru styKrab Welcome to the Krusty Krab! Choose one of the following options: Enter customer data. Display the Balanced BST horizontally. 3. Get statistics on Krabby Patties. Search for a customer's data. End Program. ENTER 1-5: Enter a customer's name or -1 to quit entering data. SpongeBob Squarepants NUMBER KRABBY PATTIES EATEN: 52 Enter a customer's name or -1 to quit entering data. NAME: Eugene H. Krabs NUMBER KRABBY PATTIES EATEN: Enter a customer's name or -1 to quit entering data. Patrick Star NUMBER KRABBY PATTIES EATEN: Enter a customer's name or -1 to quit entering data. Squidward Tentacles NAME: NUMBER KRABBY PATTIES EATEN: 18 × C:\Windows\System32\cmd.exe Enter a customer's name or -1 to quit entering data. Sandy Cheeks NAME: NUMBER KRABBY PATTIES EATEN: Enter a customer's name or -1 to quit entering data. Mrs. Puff NUMBER KRABBY PATTIES EATEN: 34 Enter a customer's name or -1 to quit entering data. Pearl Krabs NUMBER KRABBY PATTIES EATEN: Enter a customer's name or -1 to quit entering data. Gary the Snail NUMBER KRABBY PATTIES EATEN: Enter a customer's name or -1 to quit entering data. Sheldon J. Plankton NUMBER KRABBY PATTIES EATEN: Enter a customer's name or -1 to quit entering data. Mermaid Man NUMBER KRABBY PATTIES EATEN: Enter a customer's name or -1 to quit entering data. Barnacle Boy NUMBER KRABBY PATTIES EATEN: 19 Enter a customer's name or -1 to quit entering data. Flying Dutchman NUMBER KRABBY PATTIES EATEN: Enter a customer's name or -1 to quit entering data. Larry the Lobster



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Select C:\Windows\System32\cmd.exe
3.
    Get statistics on Krabby Patties.
    Search for a customer's data.
    End Program.
ENTER 1-5:
LEAST NUMBER OF KRABBY PATTIES EATEN:
                                          Gary the Snail, 1 Krabby Patties
LARGEST NUMBER OF KRABBY PATTIES EATEN: Patrick Star, 182 Krabby Patties
TOTAL NUMBER OF KRABBY PATTIES EATEN:
Welcome to the Krusty Krab!
Choose one of the following options:
    Enter customer data.
1.
2.
    Display the Balanced BST horizontally.
3.
    Get statistics on Krabby Patties.
    Search for a customer's data.
5.
    End Program.
ENTER 1-5:
Which customer are you looking for?
Barnacle Boy
Dirty Bubble
Eugene H. Krabs
Flying Dutchman
Gary the Snail
Larry the Lobster
Man Rav
                                                                                   X
Select C:\Windows\System32\cmd.exe
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Man Ray
Mermaid Man
Mrs. Puff
Patrick Star
Pearl Krabs
Sandy Cheeks
Sheldon J. Plankton
SpongeBob Squarepants
Squidward Tentacles
Enter the name of the customer.
NAME: Sandy Cheeks
Sandy Cheeks ate 12 Krabby Patties
Welcome to the Krusty Krab!
Choose one of the following options:
    Enter customer data.
    Display the Balanced BST horizontally.
3.
    Get statistics on Krabby Patties.
    Search for a customer's data.
    End Program.
ENTER 1-5:
Which customer are you looking for?
Barnacle Boy
Dirty Bubble
Fugene H. Krabs
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Select C:\Windows\System32\cmd.exe Х Flying Dutchman Gary the Snail Larry the Lobster Man Ray Mermaid Man Mrs. Puff Patrick Star Pearl Krabs Sandy Cheeks Sheldon J. Plankton SpongeBob Squarepants Squidward Tentacles Enter the name of the customer. NAME: Bob Ross Bob Ross is not a customer of the Krusty Krab. Welcome to the Krusty Krab! Choose one of the following options: 1. 2. 3. Enter customer data. Display the Balanced BST horizontally. Get statistics on Krabby Patties. Search for a customer's data. End Program. ENTER 1-5: Goodbye!