COP 5536 Fall 2019

Report of Programming Project

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Submitted by: - Anushri Jain

UFID: - **8764-6425**

UF Email Id: - ajain1@ufl.edu

Function Prototypes:-

- Below are some Macros used in code ->

  - long long ->ll

  - long double ->lbd

  - push_back -> pb

  - pair<ll,ll> ->pll

- Following are some general tree and testing functions ->

  - void lol(ll s)

  - int parent(int i)

  - int left(int i)

  - int right(int i)

  - pllgetMin()

- Following are the Prototypes of functions of Min Heap ->

- **void insert(pll k)**:

  This is used to insert the new key at the end of the tree.

- **void MinHeapify(int i)** :

  A recursive method to heapify a subtree with the root at given index

- **void extractMin()**:

  Minimum element will get removed from the min heap.

- Following are the Prototypes of functions of Red Black Tree ->

-**node new_node(int k, int v, colorm_color, node left, node right):**

It is used for creating new node of Red Black Tree.

- **treerb treerb_create():**

It is used for creating Red Black Tree

- **void properties_verification(treerb z):**

It is used for verifying the properties of Red Black Tree.

- **void ttree_printt(treerb z)**

- **void ttree_printt _helper(node m, int indent):**

It is used for printing Red Black Tree.

-**int compare_int(int leftp, int rightp):**

It is used for comparing two nodes.

-**void case1_deletion (treerb z, node m):**

This is the case 1 for deleting.

-**void case2_deletion (treerb z, node m):**

This is the case 2 for deleting.

- **void case3_deletion (treerb z, node m):**

This is the case 3 for deleting.

- **void case4_deletion (treerb z, node m):**

This is the case 4 for deleting.

- **void case5_deletion (treerb z, node m):**

This is the case 5 for deleting.

- **void case6_deletion (treerb z, node m):**

This is the case 6 for deleting.

- **node maximum_node(node m):**

It is used for returning maximum node.

- **void treerb_deletion(treerb z, int key, compare_func compare):**

It is used for deleting node from Red Black Tree.

-**void treerb_insertion(treerb z, int key, int value, compare_func compare):**

It is used for inserting node into Red Black Tree.

- **void case1_insertion(treerb z, node m):**

This is the case 1 for inserting.

- **void case2_insertion(treerb z, node m):**

This is the case 2 for inserting.

- **void case3_insertion(treerb z, node m):**

This is the case 3 for inserting.

- **void case4_insertion(treerb z, node m):**

This is the case 4 for inserting.

- **void case5_insertion(treerb z, node m):**

This is the case 5 for inserting.

- **void replace_node(treerb z, node oldm, node newm):**

It is used for replacing a node.

- **int treerb_lookup(treerb z, int key, compare_func compare):**

It is used for lookup through Node.

Structure of Program:-

Line : 0 - 40

- C++ Macros Declaration and code initializers

Line : 41 - 51

- General testing and tree functions declaration

Line : 52 - 100

- Definition of functions to create, Heapify and extract minimum in Min-Heap

Line : 100 - 709

- Definition of Red Black Tree class TREERB and its constituents

Line : 710 - 900

- Main
    - Input and file handling for I/O from files
    - Keeping track of all data time and other Functionalities
        - Print() (type 1) triple of building no, executed time, total time
        - Print() (type 2) all triplets such that bn1<=bn<=bn2
        - Insert()(type 3) insert a new building
    - Saving output paralleling in output file