Data Structures, Spring 2018

Red Black Trees

Due midnight, 2/28/2018

Red-Black Tree Verifier

Given the following data structure for a red-black tree node:

typedef struct rbtn {

char color;

char \*data;

struct rbtn \*left;

struct rbtn right;

} Node;

The color field will have a value of **zero** if the node is **black**, and a value of one if the node is red.

* Write a function which:
* Takes a pointer to a Node as the only incoming argument
* Verifies whether or not the tree rooted at Node is a valid red-black tree
* Returns a zero if it is a valid red-black tree
* Returns an integer > 0 if it is not a valid red-black tree as follows:
  + Return 1 - one or more nodes are neither red nor black
  + Return 2 – the root node is red
  + Return 3 – one or more leaves are red
  + Return 4 – one or more red nodes does not have two black children
  + Return 5 – all paths from root to leaf do not contain the same number of black nodes