REPORT OF CS3230 PJ2 ASSIGNMENT1

RBT Implementation for Phone Book

I. Implementation

A. Data Structure

Since the phone book operations need considerable number of updates, I choose RBT (i.e. red-black-tree) as the DS.

B. Algorithm

The basic operations of RBT are almost straight translation from the pseudo-code in text (i.e. *Introduction to Algorithms, Second Edition by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein*).

The validation tests of RBT and the input/output frame are provided by TA Nguyen NN.

The details of implementation are not very complex as long as one understands RBT well. I've changed some variable names so that it's more readable.

II. Time Complexity

A. Insert

$$\mathrm{O}(\lg n)$$

B. Delete

$$\mathrm{O}(\lg n)$$

C. Search

$$\mathrm{O}(\lg n)$$

D. Height

$$\mathrm{O}(n)$$

III. Pros & Cons

A. Advantage

Because the height of RBT is $\mathrm{O}(\lg n)$, basic BST operations of RBT is guaranteed $\mathrm{O}(\lg n)$.

That's why RBT is an efficient DS for frequent updates.

B. Disadvantage

1. RBT class needs an extra COLOR field.
2. The operations are a little complex, and updates may need extra fixing up.