An Exploration of RB Trees and Applications

KD Adkins, Beth Norton, Omar Batyah, Austin Hufstetler, Joanne Wardell

February 27, 2018

Abstract

A red black tree is a self balancing binary tree. The nodes on a red black tree have an extra attribute which signifies their color. There are two colors which are used in Red Black trees. The color attribute per node is used as a tool for completing an approximate balancing of the tree. Some properties of RB trees are as follows:

- Every node is either red or black.
- The root is always black.
- All terminal leaves are black.
- The children of red nodes are black.
- Any path from a given node to a leaf contains the same number of black nodes.

Our research included the study of Red Black trees and their applications in real-world systems. One such system was phone number lookup service that gave the user the ability to identify a caller from a phone number. We also used the data structure to model a school database. During this project, we explored the practical uses of RB trees, as well as their limitations in real-world systems. Our work with the RB trees allowed us to formulate opinions regarding additional applications in specific environments and systems. We also propose ways for improving the implementation of the RB tree and object oriented system that we utilized throughout the project.