CPSC 331: DATA STRUCTURES, ALGORITHMS, AND THEIR ANALYSIS

GO UEZONO

March 16, 2024

CONTENTS

1 Algorithmic Analysis 2
1.1 Loop Invariants . . . 2
1.2 Bound Functions . . . 2
2 Data Structures 2
2.1 Lists . . . 2
2.2 Stacks . . . 2
2.3 Queues . . . 2
2.4 Binary Search Trees . . . 2
2.5 Red and Black Trees . . . 3
3 Methods 4
3.1 Test sub . . . 4
3.2 Math subsection . . . 4
4 Results and Discussion 4
4.1 Subsection . . . 4
4.2 Subsubsection . . . 4

LIST OF FIGURES

LIST OF TABLES

1 ALGORITHMIC ANALYSIS

1.1 Loop Invariants

1.2 Bound Functions

2 DATA STRUCTURES

2.1 Lists

2.2 Stacks

2.3 Queues

2.4 Binary Search Trees

2.5 Red and Black Trees

Definition.

A concrete implementation of a **self-balancing** binary-search tree (reference here) that automatically maintains balance. Each node is assigned a color, hence the name. There are specific rules how to each node attains their color, which will be discussed here (reference here).

- Giving each node their respective color ensures that the tree maintains a certain balance.

After inserting an deleting nodes, complex algorithms are applied to check compliance with rules.

- In case of deviations, to restore the prescribed properties by recoloring nodes and rotations.

2.5.1 *Rotational Properties*

ASSUMPTION We will assume that values in the tree are unique.

3 METHODS

Test math notation: $\cos\pi = -1$ and $\alpha\omega$

1. 1st item in list
2. 2nd item
3. 3rd

3.1 Test sub

DESCRIPTION

2ND DESCRIPTION

3.2 Math subsection

$$\cos^3\theta = \frac{1}{4}\cos\theta + \frac{3}{4}\cos 3\theta \tag{1}$$

Definition (Gauss)**.** To a mathematician, it is obvious that $\int_{-\inf}^{+\inf} e^{-x^2}\,dx = \sqrt{pi}$.

Theorem 3.1 (Red and Black Trees)**.** *Red trees are better than black trees.*

Proof. We have that $\log(1)^2 = 2\log(1)$. We also have that $\log(-1)^2 = \log(1) = 0$. Then, $2\log(-1) = 0$, from which the proof. □

4 RESULTS AND DISCUSSION

4.1 Subsection

Test subsec

4.2 Subsubsection

Test sub

WORD Definition

CONCEPT Explanation

IDEA Text

Test Test

- First
- Second
- Third