Splay Trees
Implementation using C++

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***Abstract*—This paper discusses the significance data structures, specifically Splay Trees and their implementation of using C++**

I. Introduction

Data structures are used to organize and manage data while enabling efficient access and modification.They are a collection of data values, the relationships among them, and the functions or operations that can be applied to the data. **Splay tress** fall under the category of binary search trees with the additional property that recently accessed elements are quick to access again. They are self balancing and perform basic operations such as insertion, find and removal in amortized time.

II. TIME COMPLEXITY

Amortized complexity of find, insert, delete, and split is O(log n).Actual complexity of each splay tree operation is the same as that of the associated splay. Sufficient to show that the amortized complexity of the splay operation is O(log n).

III. Implementation

- Through the use of vitual functions and abstract classes the implementation was structured.
- 5 different functions were deployed ; Insert, Remove,Find, Preorder and Postorder.
- The tree is build using a combination of nodes with two outgoing pointers. The basic Splay tree operations such as insert, remove, and print work very similarly to that of a Binary Search Tree with the exception of the additional splaying function.
- As the most recently updated/accessed element is given the highest preference, the ”Splay” function is called which rearranges the tree and makes the recently accessed element the root of the entire Splay tree.
- The splaying function works based on any one of the 3 cases encountered ; **1)Zig-Zag situation:** X is (l child of a r child) : rotate same node to right or (r child of a l child) : rotate same node to left. **2)Zig Zig situation:** (l child of a l child) : rotate parent node to the right or (r child of a r child) : rotate parent node to the left then keep doing until it is the root **3)Zig situation:** when X is the child of the root. Rotate right or left based on the postition.

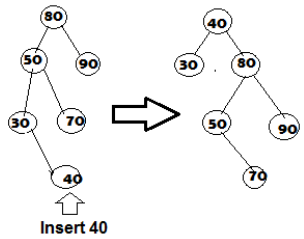

Fig. 1. An image of a insert operations on a Splay Tree

IV. Applications

Data Structures form the building blocks of every program and have unimaginably infinite number of applications. Few of the applications of Splay Trees are as follows:

- Applications: Splay Trees Good performance for a splay tree depends on the fact that it is self-optimizing, in that frequently accessed nodes will move nearer to the root where they can be accessed more quickly. Due to this fundamental property, they are extensively used in designing caching systems for computers.They are often used in applications where there is are memory constraints.

Acknowledgment

I would like to express my sincere gratitude to my supervisor to Prof.Channa Bankapur for providing his invaluable guidance and suggestions throughout the course, and also to the Teaching Assistants for their support.

References

1) http://ccf.ee.ntu.edu.tw/ yen/courses/ds17/chapter-4e.pdf
2) https://www.scribd.com/presentation/106689225/Application-of-Splay-Tree
3) https://www.sanfoundry.com/cpp-program-implement-splay-tree/