Implementation of Airports-Runway Scheduling System using AVL Trees

BACHELOR OF TECHNOLOGY

Information Technology

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March 2021

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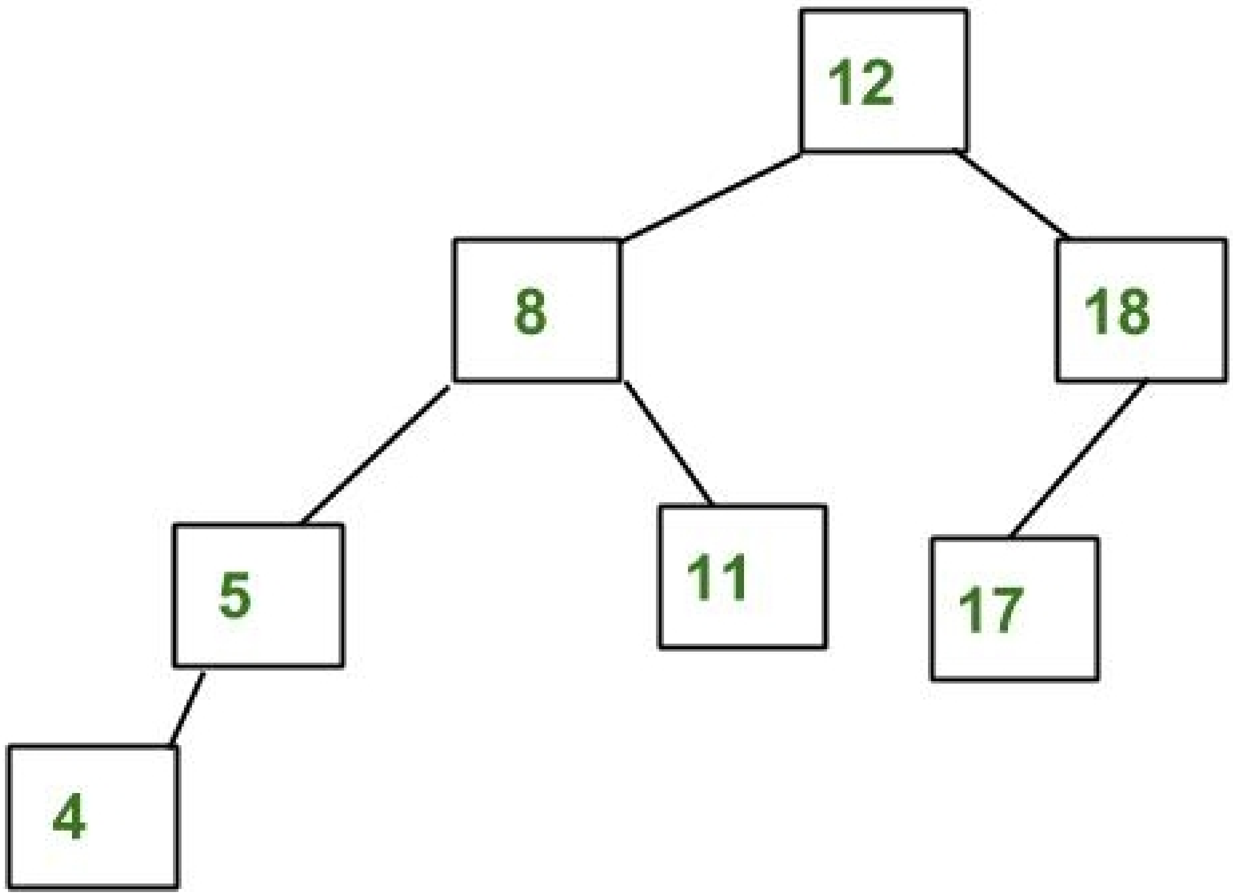
Contents

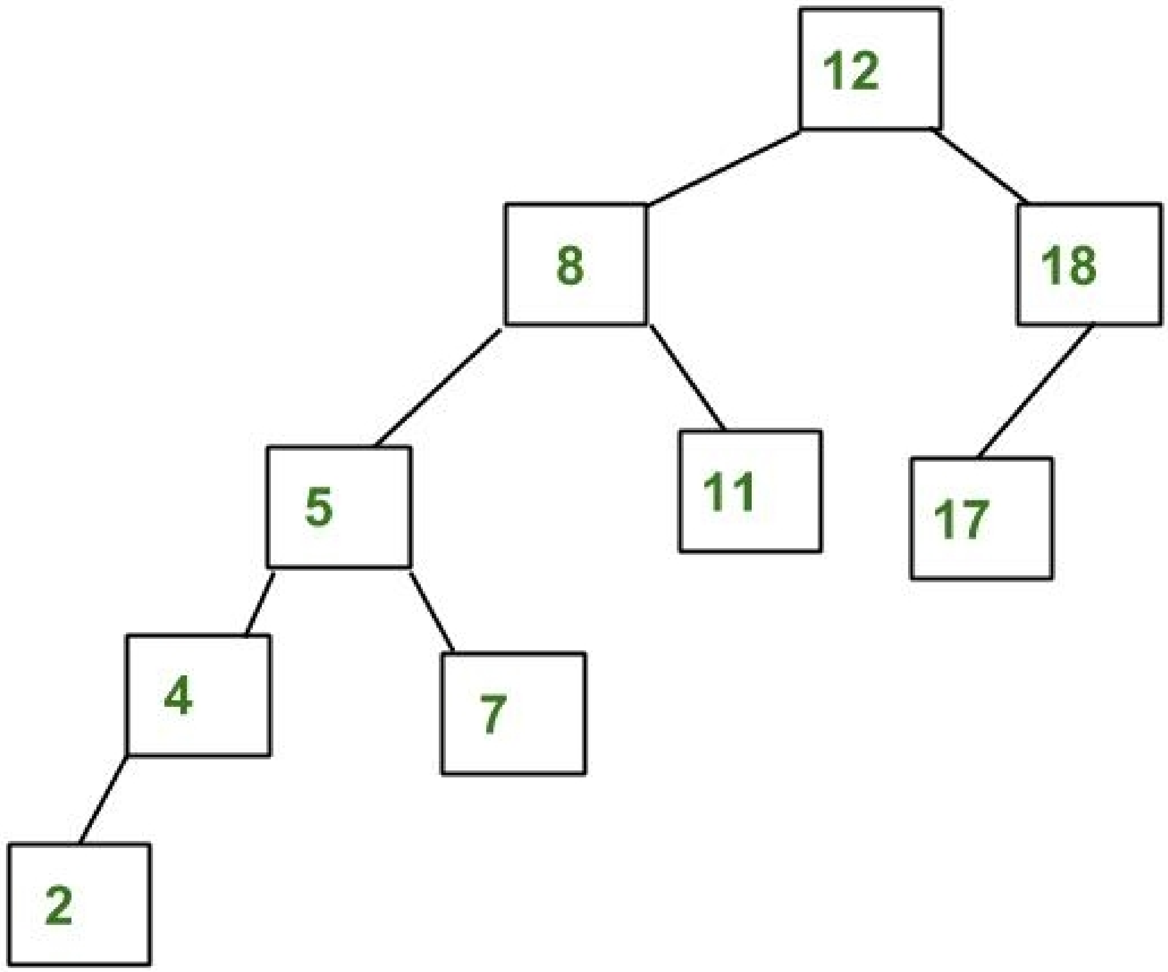
1 Introduction

AVL Trees

AVL tree is a self-balancing Binary Search Tree (BST) where the difference between heights of left and right subtrees cannot be more than one for all nodes. An Example Tree that is an AVL tree is



The above tree is AVL because differences between heights of left and right subtrees for every node is less than or equal to 1. An Example Tree that is NOT an AVL Tree

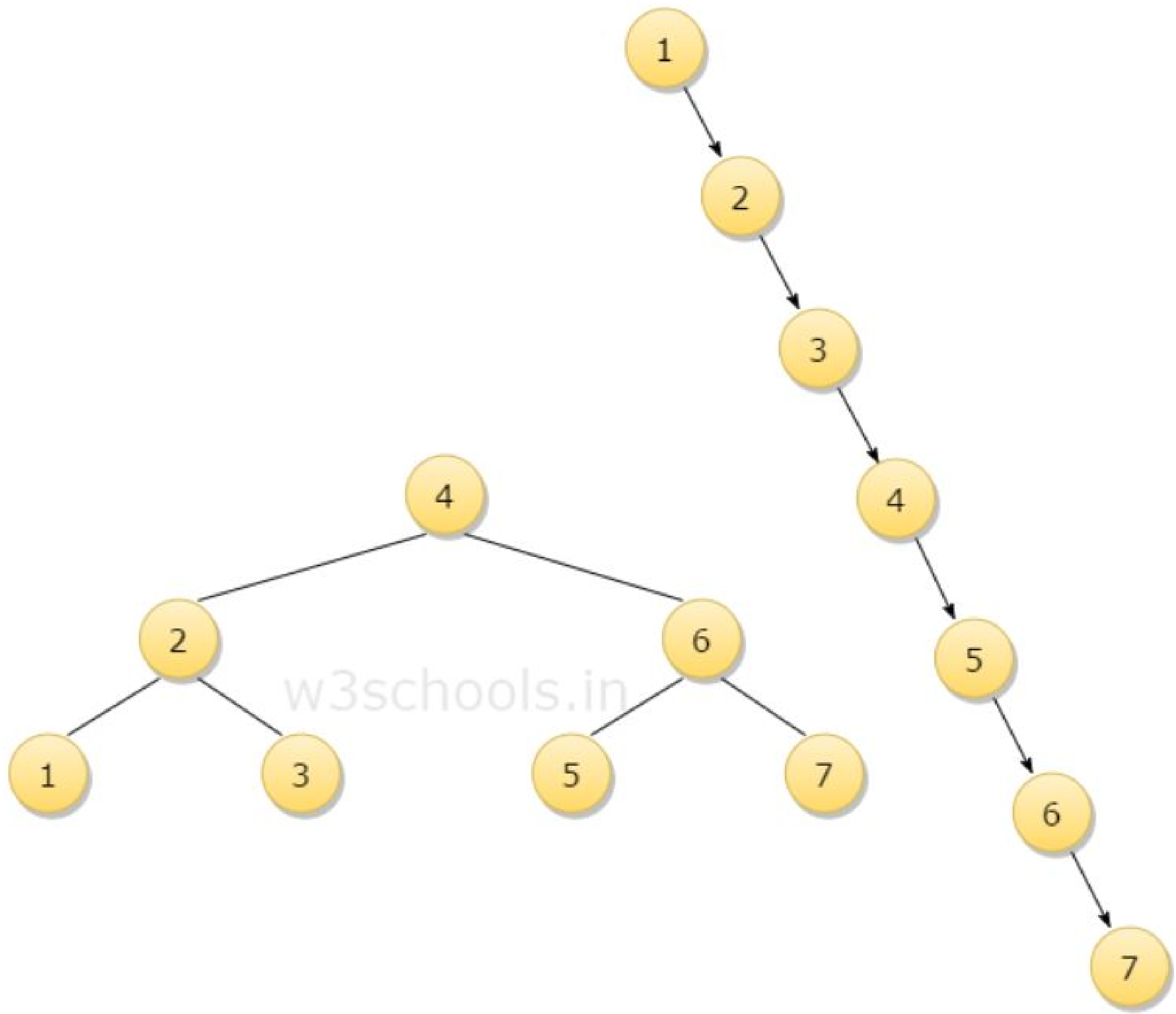


The above tree is not AVL because differences between heights of left and right subtrees for 8 and 12 is greater than 1.

Utility of AVL trees in scheduling large number of tasks.

Since AVL trees are height balance trees, operations like insertion and deletion have low time complexity. Let us consider an example:

If you have the following tree having keys 1, 2, 3, 4, 5, 6, 7 and then the binary tree will be like the second figure:



To insert a node with a key Q in the binary tree, the algorithm requires seven comparisons, but if you insert the same key in AVL tree, from the above 1st figure, you can see that the algorithm will require three comparisons.

With the above discussion we get to know that avl trees will have the low time complexity than it will help us in scheduling the airport-runway by giving the lowest time to the flight in the air in order to control air-traffic using bfs and dfs algorithms.

Rationale Airport runway optimization is an ongoing challenge for air traffic controllers. Since demand for air-transportation is predicted to increase, there is a need to realize additional take-off and landing slots through better runway scheduling. In this project, we review the techniques and tools of operational research and management science that are used for scheduling aircraft landings and take-offs. The main solution techniques include AVL trees with the help of BFS and DFS algorithms.

2 Objectives

1. To study and implement AVL trees using C++.
2. To implement a runway scheduling system for an airport with single(very busy) runway.
3. To understand the performance of AVL trees by giving different number of inputs.

3 Feasibility Study

This project is technically feasible as we will implement the AVL trees using C++ language.Also,this is economically feasible because the softwares used in this project are open source.This project is socially feasible too as the impementation of airport runway scheduling can be used by the airlines industries for the better services for their passangers.

4 Methodology/ *Planning* of work

Firstly we will study AVL trees using C++ language and after this we will do a case study on Airport-Runway Scheduling system and will implement this system using AVL trees and will see the outputs of this system by giving different inputs to the system in order to avoid risk.

5 Facilities required for proposed work

Software Required:

- Code Blocks for C++ programming
- Open source compiler for C++ programming

6 References

1. https://www.researchgate.net/publication/220340150_Airport_runway_scheduling

2. https://www.geeksforgeeks.org/avl-tree-set-1-insertion/

3. https://link.springer.com/article/10.1007/s10288-011-0172-x