

Advanced Analysis of Algorithms
Fall 2018
Assignment 4
(Splay Trees Empirical Analysis)
Submission Date: Nov 22, 2018

In this assignment you are required to perform an empirical analysis of the search operation in Binary Search Trees, AVL Trees (Height balanced) and Splay Trees (Self Adjusting). You are also required to analyze the performance of all these structures and give your findings in form of a report. Do the following tasks:

Get implementation of all these structures in same programming language (C++/Java) and using same compiler (Use bottom up implementation of Splay trees). You would need to make few changes in the code to perform the analysis.

In order to check the performance of all these structures, you would generate the data randomly using uniform distribution (in the range of $1 - n$, where n is the total number of data items in the tree) and insert this same data in all three structures. For search queries you would use two distributions (uniform and Zipf). Generate n data items in the range $1 - n$ both using uniform and zipf distribution and store them in a structure or file. Use this randomly generated data for searching all three structures.

Record the following in each search operation

- Execution time
- Number of comparisons
- Number of rotations (in case of AVL and Splay trees)

Perform n search operations on all above mentioned search structures and give your final report. The report must include the specifications of the machine and run time environment (operating system, programming language, compiler etc). Compare the performance of Splay trees with binary search trees on average execution time per search operation and average number of comparisons. Also compare the Splay trees and AVL trees on average execution time, average number of comparisons and average number of rotations per search operation. Report your results and declare which structure is better in both situations (uniform and zipf). Also report the degree of improvement.

Perform this experiment for $n=100,000$, $n=1000,000$ and $n=10,000,000$

Important Note:

Submit all the source files, random generated data and your final report in one compressed file. The name of the file must be your roll number. Please submit properly commented code. Your submitted work must be your own contribution. Any sort of plagiarism will be punished severely.