
CS29003 Algorithms Laboratory

Assignment 8: Balanced Binary Tree and Heap

General instruction to be followed strictly

1. Do not use any global or static variable unless you are explicitly instructed so.
2. Do not use Standard Template Library (STL) of C++.
3. Use proper indentation in your code and comment.
4. Name your file as <roll_no>_<assignment_no>. For example, if your roll number is 14CS10001 and you are submitting assignment 3, then name your file as 14CS10001_3.c or 14CS10001_3.cpp as applicable.
5. Write your name, roll number, and assignment number at the beginning of your program.
6. Make your program as efficient as possible. Follow best practices of programming.
7. Submit your program on Moodle before deadline. Submissions by email or any other means will NOT be considered for evaluation.

In today's assignment, you will write a program to implement a list which can perform the following operations.

- ▷ Finds both the max, min, and median (left median if there are two medians) in $\mathcal{O}(1)$ time.
- ▷ Insert a new element in the list in $\mathcal{O}(\log n)$ time.
- ▷ Print the elements in the list in non-decreasing order in $\mathcal{O}(n)$ time.
- ▷ Print the elements in the list in non-increasing order in $\mathcal{O}(n)$ time.

You can assume that the elements are distinct. Submit one single C/C++ code.

Hint: Use both balanced binary tree and heap.

Sample Output

```
1. Insert
2. Find max
3. Find min
4. Find median
5. Print in non-decreasing order
6. Exit
1
Write element to be inserted: 10
List in non-increasing order: (10,)
1
Write element to be inserted: 20
```

List in non-increasing order: (20, 10,)
1
Write element to be inserted: 30
List in non-increasing order: (30, 20, 10,)
2
Maximum: 30
3
Minimum: 10
4
Median: 20
5
List in non-decreasing order: (10, 20, 30,)
6
Program exits