

Homework

Assignment 1 Write a C program with the following basic function of a **binary min heap**: (using the struct in the textbook 1)

- a. Create an empty binary heap
- b. Percolate_up
- c. Percolate_down
- d. Push (or insert)
- e. DeleteMin (or Pop)

From these functions, write a main function to build a binary heap from inserting 10, 12, 1, 14, 6, 5, 8, 15, 3, 9, 7, 4, 11, 13, and 2, one at a time, into an initially empty binary heap. After that, show the result of calling DeleteMin functions 3 times.

Assignment 2 Give an algorithm to delete an arbitrary element from a binary min-heap. What is your time complexity?

Hint: To delete an element, first we need to search for an element. You can use any traversal algorithms (DFS, or BFS) for finding the element. After finding the element we need to follow the DeleteMin function.

Assignment 3 Give an algorithm to find all elements greater than value k in a binary max heap. What is your time complexity?

Assignment 4 Give an algorithm for merging two binary max-heaps

Assignment 5 Please implement heap sort algorithm to sort a given array of numbers in increasing order.

Given array: 34, 15, 65, 59, 79, 42, 40, 80, 50, 61, 23, 46

Assignment 6 Min-Max Heap

mm-max heap is a data structure that supports both DeleteMin and DeleteMax in $O(\log N)$ per operation. The structure is identical to a binary heap, but the heap order property is that for any node, X , at even depth, the key stored at X is smaller than the parent but larger than the grandparent (where this makes sense), and for any node X at odd depth, the key stored at X is larger than the parent but smaller than the grandparent. See Figure 6.57.

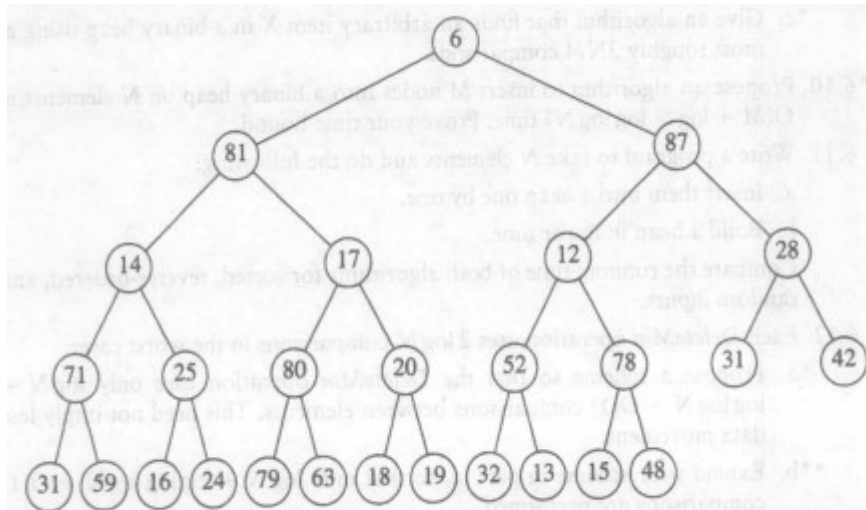


Figure 6.57 Min-max heap

- How do we find the minimum and maximum elements?
- Give an algorithm to insert a new node into the min-max heap.