CS32 Intro to Computer Science II

Baoxiong Jia & Muthu Palaniappan, DIS 1C Week 10
UCLA Spring 2021

About Us

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  - Thursday 8:30-10:30am
  - Discussion 1C: Friday 12:00-13:50pm

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  - Office Hours: Monday 10:30-11:30am
  - Wednesday 10:30-11:30am

Outline

- Heap

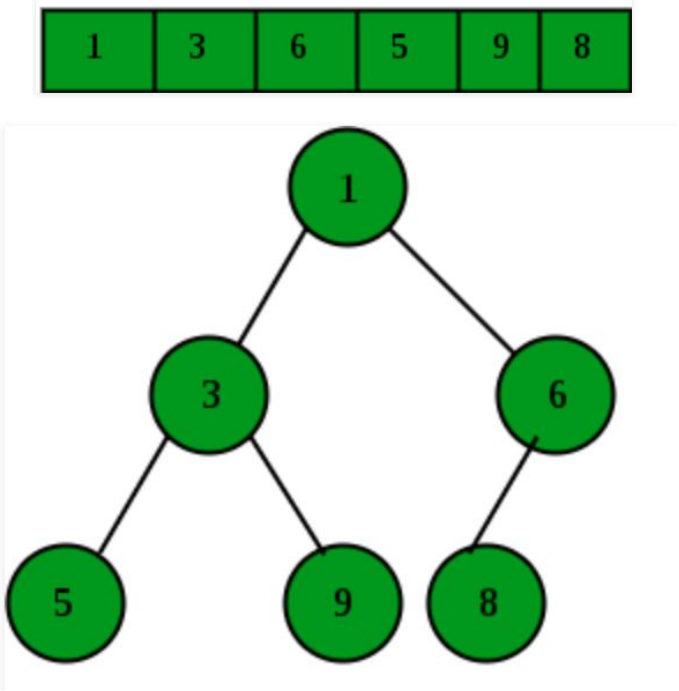
Heap

- Organizing heap in an array:
  - The root of heap goes in array[0]
  - If the data for a node appears in array[i], its children (if they exist), are in
    - Left child: array[2i + 1]
    - right child: array[2i + 2]
  - If the data for a node appears in array[i], its parent is always at array[(i - 1) / 2] (integer division)

Heap properties

- Max-heap:
  - Quickly insert a new item into the heap
  - Quickly retrieve the largest item from the heap
  - The value contained by a node is always greater than or equal to the values of the node's children
- Min-heap:
  - Quickly insert a new item into the heap
  - Quickly retrieve the smallest item from the heap
  - The value contained by a node is always smaller than the values of the node's children

Heap properties



Heap implementation

- Heap using vector:
  - https://repl.it/@jiajerry/STLHeapify#main.cpp
- Priority Queue (max-heap by default):
  - https://repl.it/@jiajerry/PriorityQueue#main.cpp
  - More reference on http://www.cplusplus.com/reference/queue/priority_queue/?kw=priority_queue

Topics we covered

- Class
  - Constructors, copy constructors(shallow copy vs deep copy), destructors, initializer lists
  - inheritance, polymorphism, abstract class
- Data structures
  - Linked list, stack, queue, tree, binary search tree, hash table (unordered_map, unordered_set), heap
- Algorithms
  - Recursion, time complexity big O, sorting algorithms
- C++ implementation
  - Templates, vector, map, set, iterators