Applications of Heaps

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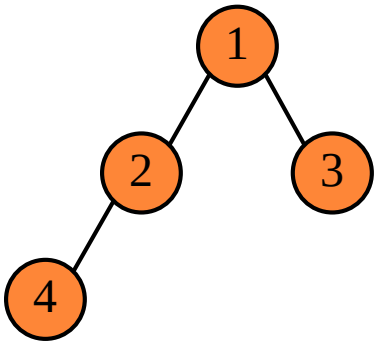
Quizzes

Quiz!

- How to build a heap in O(n)?
  - 1 3 5 7 9 11 13 15 2 4 6 8 10 12 14
- How many different possible insertion sequences can be use to generate the following min heap?



Find K Largest Numbers

- Problem
  - Given a stream of n numbers, find the k largest ones.
- Possible solutions:
  - Sort the number ➔ O(n log n)
  - Keep a pool of k largest ones ➔ O(nk)
  - Use a heap for the pool ➔ O(n log k)
- Solution using a heap:
  - Create a min-heap of size k using the first k numbers
  - For each incoming number x
    - If x>heap[1], replace heap[1] with x and restore heap order
  - The k numbers remained in the heap are what we need.

Running Median

- Problem
  - Given a stream of numbers coming one after another, calculate the median of current received set of numbers.
- Solution: (source)
  - Maintain a min-heap and a max heap.
  - Compare the incoming number with the current median and put it to the appropriate heap...

Other Practical Applications of Heaps

- Transactions in stock market
- Event-driven simulation
  - Molecular dynamics simulation