

Design and Analysis of Algorithms

4.6 Heaps

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April 29th, 2022

4.6.2

Dijkstra's algorithm uses a priority queue:

Insert Decrease-key Delete-min

Suppose we implement as an array where $A[i]$ holds key of node i .

What is the running time for delete-min? For decrease-key?

Delete-min would have a running time $O(|V|)$ because we need to search and find $\min(|V|)$. Decrease-key has a constant running time $O(1)$ because we can easily lookup the i_{th} value of an array.

4.6.4

What is the running time of a single insert operation? Similar implementation for decrease-key: do you see why?

Insert has $O(\log(n))$ runtime because it can make as many swaps as the height of the tree, $\log_2(n)$. Decrease key would also have $O(\log(n))$ runtime because first we need to find the min - $O(\log(n))$ - then we need to do the swaps after we adjust the $O(\log(n))$.