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1. [10 points] In the PDF report, explain the time complexity of both implementations of the algorithm by showing and summing up the complexity of each subsection of your code.

Heap implementation

Get\_next= O(log(V))

Update\_key = O(V)

Dijkstra runs V times

Update key runs O(V^2) at the worst case

In total O(V^3) because of the update key

Bad for highly connected components

Array implementation

Get\_next= O(V)

Update\_key = O(1)

Dijkstra runs V times

Update key runs O(V^2) at the worst case

Get\_next is run V times

In total O(V^2) because of the update key

[20 points] For Random Seed 42 - Size 20, Random Seed 123 - Size 200 and Random Seed 312 - Size 500: include a screenshot in your PDF report showing the shortest path (if one exists) for each of the three source-destination pairs (see the images included at the bottom of this document).

* For Random seed 42 - Size 20, use node 7 (the left-most node) as the source and node 1 (on the bottom toward the right) as the destination, as in the first image below.