Homework 6: Weighted Graphs

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Exercise 1

Implement the array-based version of the Dijkstras algorithm.

It is implemented in the function `DIJKSTRA_array` in the file `Dijkstra/src/dijkstra.c`

Exercise 2

Implement the binary heap-based version of the Dijkstras algorithm by using the library `binheap` that was developed during Lesson 6, Lesson 7 and Lesson 8.

It is implemented in the function `DIJKSTRA_heap` in the file `Dijkstra/src/dijkstra.c`

Exercise 3

Test the implementations on a set of instances of the problem and compare their execution times.

The two versions of Dijkstra's algorithm have been run on different input sizes and the exectution time has been measured, Figure 1 can show the difference of the execution time between them.

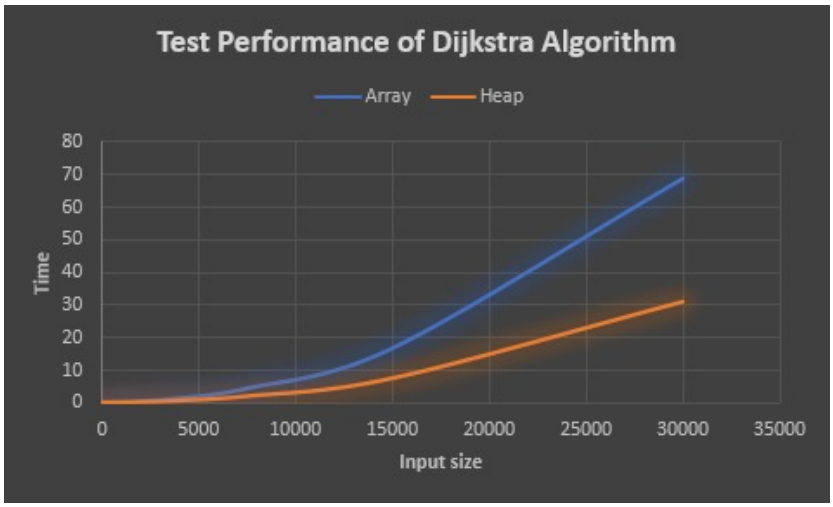

Figure 1: Time performance of the two versions of the Dijkstra's Algorithm

From the figure, we can see that Heap-based version performs better than the array-based version, and we can see a major difference for large input sizes. As we know from the lectures that the heap-based implementation has an asymptotic complexity of $\mathcal{O}((|V|+|E|)\cdot\log(|V|))$ and array-based implementation has $\Theta(|V|^2+|E|)$. Thus, our results prove that too.