Instituto Tecnológico y de Estudios Superiores de Monterrey
Campus Guadalajara

Programming of Data Structures and Fundamental Algorithms

Act 4.3 - Comprehensive Graph Activity

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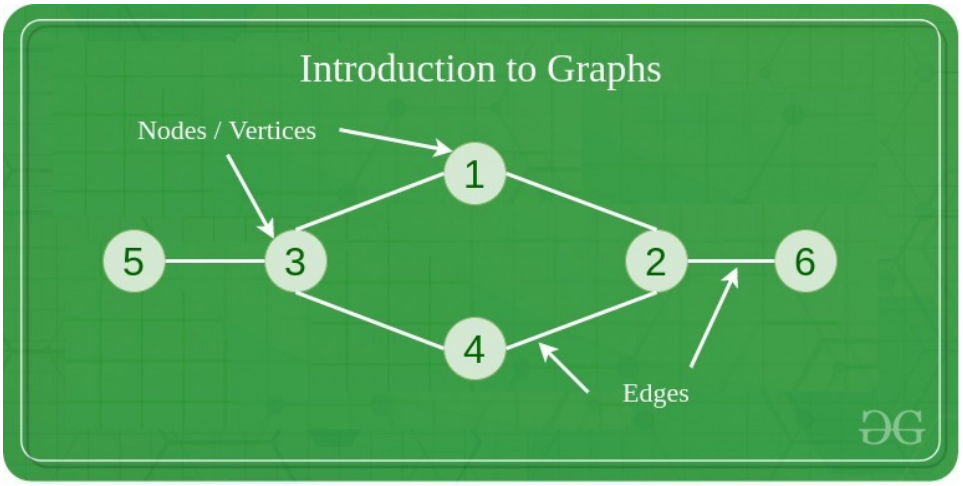
Importance of Graphs in this project

A Graph is a non-linear data structure consisting of vertices and edges. The vertices are sometimes also referred to as nodes and the edges are lines or arcs that connect any two nodes in the graph. More formally a Graph is composed of a set of vertices(V) and a set of edges(E). The graph is denoted by G(E, V). (GeeksforGeeks, 2022)



There are two ways to store a graph acording to “GeeksforGeeks” (2022):

- Adjacency Matrix
- Adjacency List

In the implementation of the solution to the activity, we used an adjacency matrix which is a table representation of all the edges of the graph. During the process of adding an edge, we updated two variables from each node: the in_degree and the out_degree, as well as a pair of int’s which represent the maximum in and out degree with its respective ip.

With the adjacency matrix, the graph is stored in the form of the 2D matrix where rows and columns denote vertices. (GeeksforGeeks, 2022)

The complexity of adding and removing an edge, as well as initializing a matrix, according to “GeeksforGeeks” (2022):

Action	Adjacency Matrix
Adding Edge	O(1)
Removing and edge	O(1)
Initializing	O(N*N)

It is important to use graphs in this situation because the representation of the information is easier to implement and follow. On the computational complexity side, removing an edge

takes O(1) time. Queries like whether there is an edge from vertex ‘u’ to vertex ‘v’ are efficient and can be done O(1). That makes the code really efficient and therefore, the best option to use. (GeeksforGeeks, 2022)

References

GeeksforGeeks. (2022, September 14). *Introduction to Graphs - Data Structure and Algorithm Tutorials*. GeeksforGeeks. Retrieved November 15, 2022, from https://www.geeksforgeeks.org/introduction-to-graphs-data-structure-and-algorithm-tutorials/

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