



Data Structure and Algorithm
Laboratory Activity No.9

Intro to Graphs

Submitted by:

Manigbas, Jeus Miguel T. <Leader>

Barredo, Alwin P.

Bela, Lorenzo Miguel D.

Callorina, Robert Victor A.

Guzon, Kean Louiz I.

Instructor:

Engr. Maria Rizette H. Sayo

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I. Objectives

Introduction

A graph is a visual representation of a collection of things where some object pairs are linked together. Vertices are the points used to depict the interconnected items, while edges are the connections between them. In this course, we go into great detail on the many words and functions related to graphs.

An undirected graph, or simply a graph, is a set of points with lines connecting some of the points. The points are called nodes or vertices, and the lines are called edges.

A graph can be easily presented using the python dictionary data types. We represent the vertices as the keys of the dictionary and the connection between the vertices also called edges as the values in the dictionary.

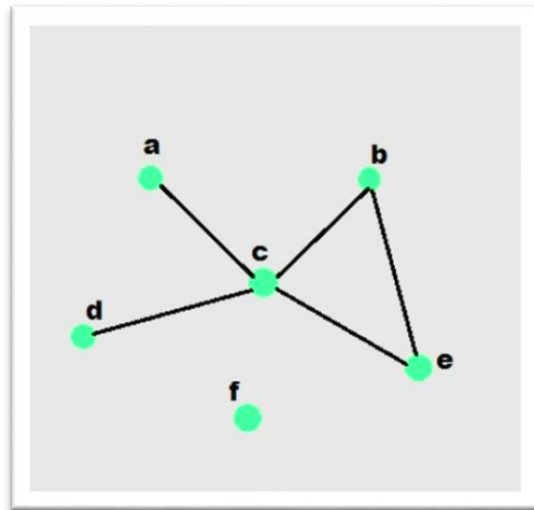


Figure 1. Sample graph with vertices and edges

This laboratory activity aims to implement the principles and techniques in:

- To introduce the Non-linear data structure – Graphs
- To discuss the importance of Graphs in programming

II. Methods

A. Discuss the following terms related to graphs:

1. Undirected graph
2. Directed graph
3. Nodes
4. Vertex
5. Degree
6. Indegree
7. Outdegree
8. Path
9. Cycle
10. Simple Cycle

III. Results

Undirected Graph:

Nodes are connected in an undirected graph without any designated direction. The relationship between nodes is symmetric; if node A is connected to node B, then node B is also connected to node A. [2]

Directed Graph:

Edges in a directed graph have a specific orientation. The link between nodes is asymmetric; the existence of a directed edge from node A to node B does not entail the existence of a directed edge from B to A.

Nodes:

Nodes, also known as vertices, are the basic building blocks of a graph. They are used to represent entities or points in a graph. [3]

Vertex:

A vertex is simply a type of node. So, when we talk about a vertex, we're referring to a single point in the graph.

Degree:

It is the number of edges connecting to the node in the case of undirected graphs. The degree is further separated into indegree and outdegree in directed graphs.

Indegree:

The indegree of a node in a directed graph is the number of edges directed into the node. It represents the number of edges that enter that node.

Outdegree:

The outdegree of a node in a directed graph is the number of edges directed out of the node. It represents the number of edges leaving that node.

Path:

In a graph, a path is a succession of nodes with each adjacent pair connected by an edge. It might be a simple path (no nodes are repeated) or a general path.

Cycle:

In a graph, a cycle is a path that begins and finishes at the same node, producing a closed loop.

Simple Cycle:

A simple cycle is one in which no node (save the starting and terminating nodes) is visited more than once and no edge is traversed more than once.

IV. Conclusion

In conclusion, graphs are networks of points linked by lines. If the connections between points do not have a direction, the graph is undirected; if they do, the graph is directed. A point's "degree" indicates how many lines are related to it.

Paths are just connected point sequences, whereas cycles are loops that begin and terminate at the same place. A simple cycle is similar to a loop but does not contain any repeated points or lines. Understanding these fundamentals allows us to make sense of how objects are connected in various sorts of graphs.

References

[1] Co Arthur O.. "Adamson University Computer Engineering Department Honor Code," AdU-CpE Departmental Policies, 2020.

[2] GeeksforGeeks. "What is an Undirected Graph? - Definition." Available:

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[3] Codecademy. "Node Cheatsheet."

Available: <https://www.codecademy.com/learn/linear-data-structures/modules/cspath-nodes/cheatsheet#:~:text=A%20Node%20is%20a%20data,link%20to%20the%20next%20node>.