UNIVERSITY OF CALOOCAN CITY
COMPUTER ENGINEERING DEPARTMENT

Data Structure and Algorithm

Laboratory Activity No. 10

Intro to Graphs

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October 11

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.
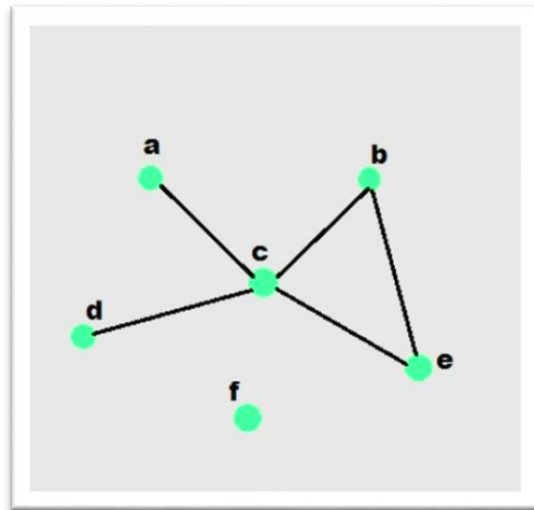

Figure 1. Sample graph with vertices and edges

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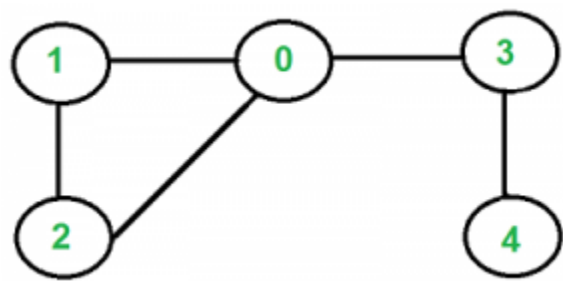1.   Undirected graph
2.   Directed graph
3.   Nodes
4.   Vertex
5.   Degree
6.   Indegree
7.   Outdegree
8.   Path
9.   Cycle
10.   Simple Cycle

III. Results

Present the visualized procedures done. Also present the results with corresponding data visualizations such as graphs, charts, tables, or image . Please provide insights, commentaries, or explanations regarding the data. If an explanation requires the support of literature such as academic journals, books, magazines, reports, or web articles please cite and reference them using the IEEE format.

Please take note of the styles on the style ribbon as these would serve as the style format of this laboratory report. The body style is Times New Roman size 12, line spacing: 1.5. Body text should be in Justified alignment, while captions should be center-aligned. Images should be readable and include captions. Please refer to the sample below:

1.   Undirected graph-An undirected graph is a type of graph where edges have no direction, meaning the connection between two vertices is bidirectional. These graphs are widely used in various applications such as social networks, traffic flow optimization, and website link analysis.

2.   Directed graph- directed graph is a type of graph where edges have a specific direction, representing one-way relationships between nodes.
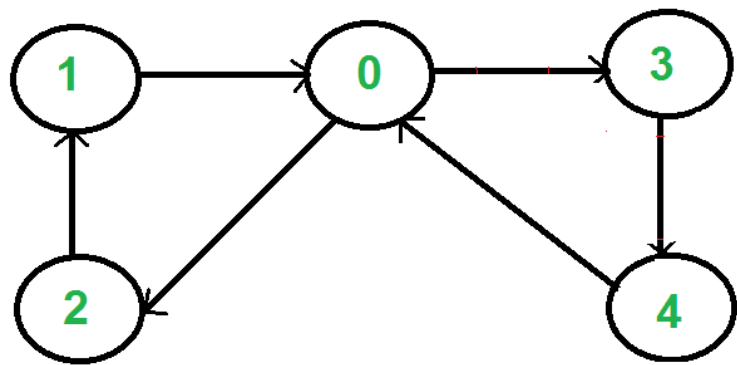
3. Nodes - Nodes are just the dots or points in a graph—the basic building blocks that edges connect. It's a casual term for vertices, often used in tech like computer networks. Imagine them as people or cities waiting to be linked up.

4. Vertex - is the fancy math word for a node: a key point in the graph where edges meet or start/end. They're labeled, like A, B, or 1, 2, and represent entities in your model. Every graph starts with a set of these.

5. Degree - is simply how many edges touch it like how many friends someone has. High degree means it's super connected; zero means it's isolated.

6. Indegree - is the number of arrows pointing into a vertex how many things are linking to it. Like incoming emails or followers. It helps gauge popularity or load on that node.

7. Outdegree - Outdegree is basically the count of arrows (edges) shooting out from a single point (vertex) in a directed graph like how many one-way streets start from your house. It's a key idea in graph theory that lets you peek into how the graph ticks

8. Path - a chain of connected vertices without repeating any (except maybe the start/end in loops). Like walking from home to work via streets. It tells you if parts of the graph are reachable from each other.

9. Cycle - is a path that loops back to where it started, forming a circle without revisiting spots in between. It's like a roundabout in traffic common in networks for detecting loops or redundancies. No cycles? Your graph is a tree, super straightforward.

10. Simple Cycle - starts and ends at the same vertex, no repeats anywhere else. No detours or extras just a pure circle, like a triangle of three connected points. Key for stuff like finding the smallest loops in maps or algorithms.

IV. Conclusion

The conclusion expresses the summary of the whole laboratory report as perceived by the authors of the report.

I learned in this activity is all of the definitions and meaning of undirected graph, directed graph, nodes, vertex, degree, indegree, outdegree, path, cycle, and simple cycle. With this activity it helps me to enlighten more about this kinds of topics.

References

[1] Co Arthur O.. "University of Caloocan City Computer Engineering Department Honor Code," UCC-CpE Departmental Policies, 2020.