Data Structure and Algorithm

Laboratory Activity No. 10

Intro to Graphs

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OCTOBER 11, 2025

# 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.

A diagram of a triangle with green dots

AI-generated content may be incorrect.

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

# Methods

* 1. 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

# Results

**1. Undirected Graph** – An undirected graph is a graph containing edges that have no direction. It can represent social networks, traffic flow optimizations, and website analysis [1].

**2.** **Directed Graph** – A undirected graph is a graph containing edges that have direction. It can represent social networks, transportation networks, computer networks, and project management [2].

**3. Nodes** – Are the physical or logical connection points in a computer network or data structure. It contains data and its links [3].

**4. Vertex** – The representation of points in a graph or a tree. Vertices can be also called nodes [4].

**5. Degree** – A degree in a tree data structure is defined as the number of children a node has [5].

**6. Indegree** – An indegree is defined as the number of incoming edges on a vertex in a directed graph [6].

**7. Outdegree** – An outdegree is defined as the number of outgoing edges on a vertex in a directed graph [7].

**8. Path** – Is a trail in which neither vertices nor edges are repeated [8].

**9. Cycle** – A closed path that starts and ends with the same vertex [8].

**10. Simple Cycle** – A closed path that starts and ends with the same vertex without repeating other edges or vertices [8]

# Conclusion

A graph consists of vertices (or nodes) and edges that establish the connection between them. An undirected graph has edges without direction, whereas a directed graph contains edges that points at a specific direction. The degree of a node determines the number of children it has with the indegree and outdegree determining the incoming and outgoing edges in the directed graphs, respectively.

A path in a graph is a sequence of edges and vertices without repetition, while a cycle is a path that loops back to the same vertex. A simple cycle is defined as a type of cycle where no vertex or edge is repeated except the starting and ending vertex.

**References**

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