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Role of Incidence Metric with Special Reference to Its Relationship between Two Classes of Objects

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Abstract - In an undirected graph G, two vertices u and v are called connected if G contains a path from u to v. Otherwise, they are called disconnected. A graph is called connected if every pair of distinct vertices in the graph is connected; otherwise, it is called disconnected.

A graph is called k-vertex-connected or k-edge-connected if no set of k-1 vertices (respectively, edges) exists that, when removed, disconnects the graph. A k-vertex-connected graph is often called simply k-connected.

A directed graph is called weakly connected if replacing all of its directed edges with undirected edges produces a connected (undirected) graph. It is strongly connected or strong if it contains a directed path from u to v and a directed path from v to u for every pair of vertices u, v.

Key words: connected, disconnected, weakly connected, strongly connected.

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INTRODUCTION

Typically, a graph is depicted in diagrammatic form as a set of dots for the vertices, joined by lines or curves for the edges. Graphs are one of the objects of study in discrete mathematics.

The edges may be directed or undirected. For example, if the vertices represent people at a party, and there is an edge between two people if they shake hands, then this is an undirected graph, because if person A shook hands with person B, then person B also shook hands with person A. In contrast, if the vertices represent people at a party, and there is an edge from person A to person B when person A knows of person B, then this graph is directed, because knowledge of someone is not necessarily asymmetric relation (that is, one person knowing another person does not necessarily imply the reverse; for example, many fans may know of a celebrity, but the celebrity is unlikely to know of all their fans). This latter type of graph is called a *directed* graph and the edges are called *directed edges* or *arcs*.

Vertices are also called *nodes* or *points*, and edges are also called *lines* or *arcs*. Graphs are the basic subject studied by graph theory. The word "graph" was first used in this sense by J.J. Sylvester in 1878.[2]

REVIEW OF LITERATURE

Much research in graph theorywas motivated by attempts to prove that all maps, like this one, could becolored with only four colors.Kenneth Appel and Wolfgang Hakenfinally proved this in 1976.[5]

The history of discrete mathematics has involved a number of challenging problems which have focused attention within areas of the field. In graph theory, much research was motivated by attempts to prove the four color theorem, first stated in 1852, but not proved until 1976 (by Kenneth Appel and Wolfgang Haken, using substantial computer assistance).[5]

In logic, the second problem on David Hilbert's list of open problems presented in 1900 was to prove that the axioms of arithmetic are consistent. Gödel's second incompleteness theorem, proved in 1931, showed that this was not possible – at least not within arithmetic itself. Hilbert's tenth problem was to determine whether a given polynomial Diophantine equation with integer coefficients has an integer solution. In 1970, Yuri Matiyasevich proved that this could not be done.

The need to break German codes in World War II led to advances in cryptography and theoretical computer science, with the first programmable digital electronic computer being developed at England's Bletchley Park. At the same time, military requirements motivated advances inoperations research. The Cold War meant that cryptography remained important, with fundamental advances such as public-key cryptography being developed in the following decades. Operations research remained important as a tool in business and project management, with the critical path method being developed in the 1950s.

MATERIAL AND METHOD

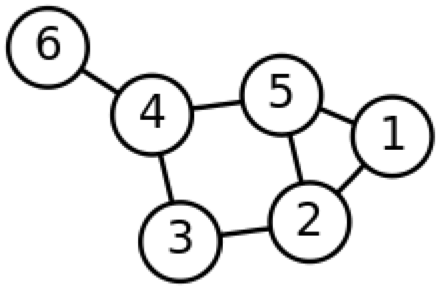
Two edges of a graph are called **adjacent** (sometimes **coincident**) if they share a common vertex. Two arrows of a directed graph are called **consecutive** if the head of the first one is at the nock (notch end) of the second one. Similarly, two vertices are called **adjacent**if they share a common edge (**consecutive** if they are at the notch and at the head of an arrow), in which case the common edge is said to **join** the two vertices. An edge and a vertex on that edge are called **incident**.

The graph with only one vertex and no edges is called the **trivial graph**. A graph with only vertices and no edges is known as an**edgeless graph**. The graph with no vertices and no edges is sometimes called the **null graph** or **empty graph**, but the terminology is not consistent and not all mathematicians allow this object.

In a **weighted** graph or digraph, each edge is associated with some value, variously called its *cost*, *weight*, *length* or other term depending on the application; such graphs arise in many contexts, for example in optimal routing problems such as the traveling salesman problem.

Normally, the vertices of a graph, by their nature as elements of a set, are distinguishable. This kind of graph may be called **vertex-labeled**. However, for many questions it is better to treat vertices as indistinguishable; then the graph may be called **unlabeled**. (Of course, the vertices may be still distinguishable by the properties of the graph itself, e.g., by the numbers of incident edges). The same remarks apply to edges, so graphs with labeled edges are called **edge-labeled** graphs. Graphs with labels attached to edges or vertices are more generally designated as **labeled**. Consequently, graphs in which vertices are indistinguishable and edges are indistinguishable are called *unlabeled*. (Note that in the literature the term *labeled* may apply to other kinds of labeling, besides that which serves only to distinguish different vertices or edges.)

Examples



A graph with six nodes.

- The diagram at right is a graphic representation of the following graph:

$V = \{1, 2, 3, 4, 5, 6\}$

$E = \{\{1, 2\}, \{1, 5\}, \{2, 3\}, \{2, 5\}, \{3, 4\}, \{4, 5\}, \{4, 6\}\}$.

- In category theory a small category can be represented by a directed multigraph in which the objects of the category represented as vertices and the morphisms as directed edges. Then, the functors between categories induce some, but not necessarily all, of the digraph morphisms of the graph.

- In computer science, directed graphs are used to represent knowledge (e.g., Conceptual graph), finite state machines, and many other discrete structures.

- A binary relation *R* on a set *X* defines a directed graph. An element *x* of *X* is a direct predecessor of an element *y* of *X* iff *xRy*.

Important graphs

CONCLUSION

- In a complete graph, each pair of vertices is joined by an edge; that is, the graph contains all possible edges.

- In a bipartite graph, the vertex set can be partitioned into two sets, *W* and *X*, so that no two vertices in *W* are adjacent and no two vertices in *X* are adjacent. Alternatively, it is a graph with a chromatic number of 2.

- In a complete bipartite graph, the vertex set is the union of two disjoint sets, *W* and *X*, so that every vertex in *W* is adjacent to every vertex in *X* but there are no edges within *W* or *X*.

- In a *linear graph* or path graph of length *n*, the vertices can be listed in order, $v_0, v_1, ..., v_n$, so that the edges are $v_{i-1}v_i$ for each $i = 1, 2, ..., n$. If a linear graph occurs as a subgraph of another graph, it is a path in that graph.

- In a cycle graph of length *n* ≥ *3*, vertices can be named v_1, ..., v_n so that the edges are $v_{i-1}v_i$ for each *i* = 2,...,*n* in addition to v_nv_1. Cycle graphs can be characterized as connected 2-regular graphs. If a cycle graph occurs as a subgraph of another graph, it is a*cycle* or *circuit* in that graph.

- A planar graph is a graph whose vertices and edges can be drawn in a plane such that no two of the edges intersect (i.e.,*embedded* in a plane).

- A tree is a connected graph with no cycles.

- A *forest* is a graph with no cycles (i.e. the disjoint union of one or more *trees*).

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