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A STUDY ON GRAPHS AND CIRCUITS

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Abstract:

A significant area of mathematics called graph theory is used in fields including computer science, engineering, and the social sciences. In this paper, the topic of graphs and circuits is explored, with a focus on the characteristics and applications of graphs and circuits in various fields. The paper begins by describing the fundamental ideas behind graphs and circuits before going over some of these ideas' most significant characteristics and uses. They include Hamiltonian circuits, Euler's formula, and planarity. Finally, the paper discusses some of the current and future research directions in this field.

Keywords:

Graphs, circuits, planarity, Euler's formula, Hamiltonian circuits, Network Circuit.

Introduction:

The study of graphs, which are mathematical structures used to represent relationships between objects, is known as graph theory. a graph G is a pair of sets (V, E), where V is the set of vertices(nodes) and E is the set of edges (lines), formed by pairs of vertices. Graph theory has many applications in fields such as computer science, engineering, and social sciences. In this paper, we will explore the topic of graphs and circuits, specifically looking at the properties and applications of these concepts.

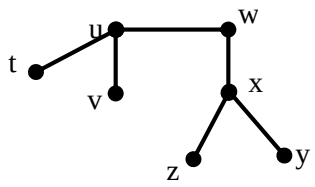
The study of electronics requires the use of mathematical techniques. Electronics have made a significant impact on the growth of contemporary society. Electronics play a major role in signal processing, communications, and information processing. With the use of graph theory, it is now possible to study the properties of electronic circuits more easily. This is a fast-spreading trend.

Basic Concepts:

Before we can explore the properties and applications of graphs and circuits, we must first define the basic concepts. A graph G is made up of two sets of objects: vertices (also referred to as points or nodes) $V = \{v1, v2, v3, \ldots\ldots\}$ and edges (also called **lines** or **arcs**) $E = \{e1, e2, e3, \ldots\ldots\}$. The vertex set of G is denoted by the set V(G), and the edge set by the set E(G). The graph is typically written as G = (V,E)

For example:

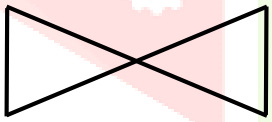
A graph G is defined by the sets $E(G) = \{tu, uv, uw, wx, xy, xz\}$ and $V(G) = \{t, u, v, w, x, y, z\}$ and Graph G with 7 vertices and 6 edges.



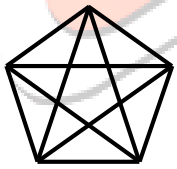
- The vertex set of G is denoted by the set V(G), and the edge set by the set E(G).
- A (p, q) graph is a graph with p vertices and q edges.
- A trivial graph is the graph (1, 0).
- A self-loop is an edge that has the same vertex as both of its end vertices.
- More than one edge associated a given pair of vertices called parallel
- A path in a graph is a walk in which no vertex is repeated.
- A path that begins and finishes at the same vertex is known as a **circuit**.
- A cycle is a circuit in which no vertex is repeated except for the first and last vertices.

Planarity:

One of the most important properties of a graph is planarity. In graph theory, a planar graph is a graph that can be drawn on a plane so that its edges only intersect at their ends, or one that can be contained within the plane. In other words, it can be drawn without any edges overlapping one another. The concept of planarity has many applications in fields such as computer science, where planar graphs are used to model electronic circuits and networks. Euler's formula is an important result in the study of planar graphs, which states that for any planar graph with V vertices, E edges, and F faces, $V - E + F = 2$.



Planar Graph



non-planar Graph

- A connected graph is said to be planar if it can be drawn with no edges crossing.
- When a planar graph is represented in this manner, the plane is divided into sections known as faces.
- An Euler path is a walk around a graph that utilises each edge exactly once.
- An Euler path that begins and ends at the same vertex is said to be closed, and this type of path is referred to as an Euler circuit.
- An Eulerian graph is a graph that contains an Eulerian circuit.

Hamiltonian Circuits:

Another important property of graphs is the existence of Hamiltonian circuits. A Hamiltonian circuit is a circuit that passes through every vertex of a graph exactly once. The problem of finding Hamiltonian circuits is an important area of research in computer science, where it has applications in optimization and scheduling problems.

A Hamiltonian path – A simple path in a graph G that precisely traverses each vertices once is called a Hamiltonian path.

Hamiltonian Circuit – A simple circuit in a graph G that passes through every vertex exactly once is called a Hamiltonian circuit.

There is no simple necessary and sufficient criterion to identify whether a graph has any Hamiltonian paths or circuits, in contrast to Euler paths and circuits. However, there are several conditions that preclude the existence of a Hamiltonian circuit in a graph. For example, if a graph has a vertex of degree 1, a Hamiltonian circuit cannot exist in that graph.

Applications:

Graph theory has many applications in various fields. In computer science, graph theory is used to model networks, circuits, and data structures. In engineering, graph theory is used to model systems and processes, and to optimize designs. In social sciences, graph theory is used to model social networks and to study the spread of information and disease. Graph theory is also used in operations research, biology, chemistry, and many other fields.

Conclusion:

Mathematical graph theory is a significant area of study with several applications. In this paper, we have explored the subject of graphs and circuits, focusing on the characteristics and uses of these ideas. We have discussed some of the most significant characteristics and uses of the fundamental notions of graphs and circuits. We have also talked about some of the present and upcoming directions for this field of study.

References:

1. Bondy, J. A., & Murty, U. S. R. (2008). Graph theory (Vol. 244). Springer Science & Business Media.
2. Diestel, R. (2010). Graph theory (Vol. 173). Springer Science & Business
3. https://edurev.in/studytube/Graph-Theory/65b21cb0-6225-4edc-a6e1-edaed0397c13_t
4. https://www.jetir.org/papers/JETIR2110308.pdf
5. https://www.jetir.org/papers/JETIR1903B80.pdf
6. http://campus.murraystate.edu/academic/faculty/kfister1/Current/117Blitzer6ed14_1_2Fall2014.pdf
7. https://diposit.ub.edu/dspace/bitstream/2445/170548/1/170548.pdf