Applications of Graph Theory in Various Scientific Fields

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Abstract

Graph theory is a branch of mathematics widely used in other areas of mathematics and other fields of science. It also has an important role in our daily life. In this article, we have discussed the application of graph theory in our daily lives and in various areas of science such as computer science, surgical research, chemistry, physics, engineering, etc. We have discussed two parts of this document; the first part provides the introduction and history of the graph theory and the second part gives an overview of some application of graph theory.

Keywords: We Operation Research, Graph, Path, Walk, Euler Graph, Hamiltonian graph, Network.

1. Over View Of Graph Theory

Introduction

In the first part of this article, we analyze the introduction, history and origins of graph theory and some definitions that are commonly used when studying this topic. Many honest humanity situations can be described by a diagram consisting of a collection of points consisting of rows that join some of these points. Eg: Points can be people with lines that join with friends. A mathematical idea of such situations increases the summary of a graph. Graph theory is graphing learning that are arrangements used to ideally link the article between two a graph is completed with the edges E and the V vertices that link them. The graph is a pair of order G = (V, E) consisting of a non-empty group V (G) of vertices with a group E (G) of the edges.
History
The main source of graphic theory was the problem of the Konigsberg Bridge. The city of Konigsberg was on both sides of the Pregel River and included two large islands connected to each other or the city with seven bridges. There was a question in the minds of Konigsberg residents if they could travel to the city, crossing each of the seven bridges over and over again. In 1736, Leonhard Euler (1707-1783) concentrated on the problem of the Konigsberg Bridge and concluded that no matter how he walked around the land or where the bridges were, it could not be done. This led to the concept of Euler's letter in solving this problem; Euler introduced the new branch of mathematics, namely, the theory of graphics. In 1840, A.F. Mobius presented the idea of a full graphic and bilateral graph. In 1845, Gustav Kirchoff introduced the concept of tree and applied the concept of tree in the calculation of currents in electric circuits. In 1852, Thomas Guthrie found the famous problem of the four colors. In 1856, P. Kirkman and William R. Hamilton studied polyhydric cycles and invented the concept of the Hamiltonian graph. Although the problem of the four cards was devised, it was not resolved at that time. This problem was solved after a century by Kenneth Appel and Wolfgang Haken in 1976. It was the first great theorem that tried to use the computer. The term Script was introduced by Sylvester in 1878. Thus the theory of graphics was developed.

Preliminary
In this section, we have listed some important definitions that are commonly used in graph theory.

1.1 Walk: - A walk is defined as an alternative finite sequence of vertices and edges that start and end with vertices, so that each skirt is an incident with the vertices before and after it. The number of strokes on the walks is called the length of the ride.

1.2 Trail: - If the edges of the walk are distinct then the walk is called Trail.

1.3 Path: - A path is a trail in which all vertices of the open walk are distinct.

1.4 Circuit (Cycle): - It is said that a closed walk is a circuit that has no roof and is seen more than once apart from the terminals.

1.5 Euler route: - A track in the G graph is called the Euler route if it includes each edge of the G graph only once.

1.6 Euler cycle: the divided cycle is a cycle in the graph G is a closed path of the graph G that includes each edge of the graph G only once.

1.7 Eulerian graph: - A graph G containing the Euler path or the Euler cycle is called the Eulerian graph.
1.8 Hamiltonian Path: -The route to Hamilton in a graph G is a route that contains every corner of the graph G exactly once.

1.9 Hamiltonian Cycle: - A cycle in a G graph is called a Hamiltonian Cycle if it contains a peak exactly once, except for the first and last peak.

1.10 Hamilton graph: -A graph G that has a Hamilton or Hamilton cycle is a Hamilton graph.

2. Applications of graph theory

The concepts of graph theory are widely used in various disciplines of science. In general, without knowing the concepts of the graphic, we also use them in our daily life. For example, when we have to go to a place that is linked to our starting point in different ways, we use the shortest way to get to the destination soon. Here, if we look at this problem in terms of graph theory, the two positions can be considered peaks and the streets are like edges. If we also think about the direction of the trip, then the graph should be directed. In the same way, we can use these concepts of graph theory in different situations. A table can be used to present almost any physical state that implies discretion and relationship between them Here we will discuss the applications of graph theory in various disciplines of science.

Fig. 1.1: Types of Application
2.1 GRAPHIC APPLICATIONS THEORY IN DAILY LIFE

2.1.1 GPS or Google Maps

GPS or Google Maps are to find a shorter route from one destination to another. Destinations they are the vertices and their links are edges consisting of distance. The optimal route is defined by the software. Schools / colleges are also using this technique to pick up students from their stop to school. Each stop is a climax and the road is an advantage. A Hamiltonian road represents the efficiency of incorporating each roof on the road.

2.1.2 Social networks

The Internet is a very useful invention of modern science. The concepts of graph theory are used in the Internet work technique. We connect with friends through social networks or the video goes viral, here the user is Vertex and the other related users create an advantage, so take videos Viral when it is reached in certain connections. In the case of Internet connectivity, all users are considered peaks and the connection between them is edges. Then, all Internet users are a very complex graph and data and information from one user to another are shared by the shortest route between them. Similarly, in the case of social networking sites, a friend associates with all of their friends and their friends also associate with others. If we consider friends as the top of the chart and establish an advantage between them if they are friends, then it will be a chart.

2.1.3 To clear the blockade of the road

When the streets of a city are blocked due to ice. Planning is needed to put salt on the road. So Paths or circles of Euler are used to pass the roads in the most efficient way.

2.1.4 When using Google to search web pages, the pages are related to each other from hyperlinks. Every page is a climax and the link between the two pages is an edge.

2.2 APPLICATIONS OF GRAPHIC THEORY IN TECHNOLOGY

Applications in chemistry:

Graph theory is used in chemistry for the mathematical modeling of chemical phenomena. We can make the physical model of a molecule where the peaks represent atoms and the ends are a bond. There is a branch of mathematical
chemistry called chemical graph theory (CGT) that deals with the applications of nontrivial graph theory to solve molecular problems. The pioneers of chemical graphics theory are Alexander Balaban, Ante Graovac, Ivan Gutman, Haruo Hosoya, Milan Randić and Nenad Trinajstic and others. The theory of graphs is also used in computational biochemistry.

Applications in physics:

The theory of graphics is also used in the field of physics. Generally, the concepts of graphics are used in different electrical circuit’s current, voltage and resistance in a circuit can be designed using the concept of graph theory. When we want to show the flow of current in the circuits, we can use directed graphics. We can also link the different physical processes with the help of the theory of graph theory.

Applications in biology:

The theory of graphics is used in many areas of biology. The graph can be used in the identification of the drug target, which determines the function of the protein or gene. The concepts of graph theory can also be used in the study of DNA and RNA structures. If we want to study the food chain of different animals in an ecological system, then we design some arrows that represent the dependence of one animal on another for its food. This table can be considered as a graph where the animals are at the top of the graph and should be linked if one of them depends on the other for feeding.

Applications in OR:

The theory of the graph is a dynamic tool in the combination Operational research. Some important actions explore the problems that can be explained using the graphics are given here. The transport network is used to model of the transport of goods of one destination to another destination. The target is to maximize flow or minimize costs in the proposed flow. The theory of the graph is established as more responsible for such problems although they have more restrictions.

3. Conclusion

The main objective of this article is to present the importance of graph theory in various disciplines of science and our daily life. This document is valuable for
students and researchers to obtain an overview of the theory of graphics and its application in various fields such as everyday life, computer science, operational research and chemistry. Here we have discussed only some applications of graph theory. There are many applications of graph theory in various disciplines such as economics, logistics, etc. Therefore, graph theory has become a subject in itself with a variety of applications.

4. REFERENCES


