Applications of Graph Theory

Our cultural world not only has letters and numbers today, but it is full of images. Images that are part of our lives are of very different types. Alongside, those of our natural environment around us photographs of all kinds, and among these, unconventional schemes. There are schemes in a company logos on traffic signs, on maps, on bus tours, etc. Graph theory is a scheme that can solve many interesting problems, and it is already part of the current mathematics. The first chapter of this book focuses on the birth of graph theory from solving the Euler problem, and giving emphasis to the development, definition, and explanation of this theory in general.

The term graph comes from the expression "graphic notation" first used by Edward Frankland and subsequently adopted by Alexander Crum Brown in 1884 and referred to the graphical representation of the bonds between atoms molecule.

The first book on graph theory was written by Denes Konigand published in 1936. Thanks to graph theory, various problems can be solved, such as the synthesis of circuits sequential counters or opening systems. It is used for various areas such as computer drawing, in all fields of engineering.

Graphs are also used to model paths such as a bus through the streets of a city, where we can get optimal paths for applying different path algorithms such as the algorithm Floyd.

Graph theory has also served as inspiration for the social sciences, especially to develop a non-metaphorical concept replacing nodes by social actors and to verify the position, centrality, and importance of each actor within the network. This measure allows quantifying and abstracting complex relationships, so the social structure can be represented graphically. For example, a social network can represent the structure of power within a society by identifying the links (edges), its direction and intensity and suggests the way in which power is transmitted.

It is used in production control problems, to design computer networks, for designing modern electronic modules and project physical parameters localized systems (mechanical, acoustic, and electric).

It is used for troubleshooting problems genetic and automation projection (EWRS). Mathematical support of modern systems for information processing comes in nuclear (technique of Feynman diagrams) research.

Graphs are important in the study of biology and habitat. The apex represents a habitat and edges (or "edges") represent the animal trails or migration. With this information, scientists can understand how this can change or affect species in their habitat.

The first chapter is focused on all the basics that has since its inception, from the definition of edges to the great theorems that exist today and can be applied in their many applications.

In the second chapter, graphs are related to applications ranging from the Internet and scientific-technical issues to social studies, stressing that graph theory is there, in science, in research, in personal and everyday life.

In the sixth chapter, applications that can be represented by graph theory and its properties are presented: applications such as optimization of time or other, maps, and colors, PERT system, power grids, computer circuits are introduced.

Finally, the last chapter will focus on the importance that can have great theory in education through many games based on graphs, which allow to test mental ingenuity. Different experiences in mathematics education show that there are resources in graph theory which have a high educational value, as there are examples of mathematical modeling that, despite their simplicity, provide interesting real situations that can be described and studied by associating graphs.

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