EMERGING TRENDS IN THEMATIC MAPPING-METHODS AND MATERIALS

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Abstract

Present paper deals with the methods and materials of thematic mapping, a graphical representation of structural characteristics of geographical phenomena, with focus on recent trends. Thematic mapping involves two important transformations; the alteration of the unmapped data into a set of graphic marks that are placed on the map and readers registering these marks and deducing the spatial information from them. Special care with cartographic skill is essential for preparation of different types of thematic maps. With increasing dependency on electronic media and availability of finer resolution data, large scale thematic maps are becoming more common. Multivariate and dynamic maps are out placing the single element and static maps, which in turn is throwing more challenges to the readers as well as makers.

Key words: Thematic map, Cartographic Generalization, Dynamic maps,

Introduction

The graphic representation of the geographic setting is a map .Maps drawn with the objective to show the distribution of a single attribute or the relationship among several are known as Thematic maps. International Cartographic Association defines the Thematic Map as "a map designed to demonstrate particular features or concepts". It is also called a special purpose map. Thematic maps range from satellite cloud cover images to shaded image of average annual income. Map dealing with the same phenomena can be called general purpose map if the objective is to show the locational aspect of that phenomena and thematic map if their focus attention is on the structural characteristics of geographical distribution which include distance & directional relationships, spatial variation and interrelationships of some geographic distribution. In the past, these maps tended to be of small scale. At present, the scale of thematic maps varies from small to large. Reasons are relatively finer resolution of available data and expansion of graphic and printing limits.

Components of the Thematic Map

Every thematic map is composed of two important elements. A geographic or base map and a thematic overlay .The geographic base map provide locational information to which thematic overlay can be related. It must be well designed and include only the amount of information thought necessary to convey the map's message. Thematic overlay provides the required information about the subject. Simplicity and clarity are important design features of the thematic overlay. The use of thematic map needs integration of these two visually and intellectually during map reading.

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Thematic map proceedings

Thematic mapping involves two important transformations. The first transformation involves the alteration of the unmapped data into a set of graphic marks (symbols) that are placed on the map. This process is one of abstraction and requires cartographic generalization which involves selection, classification, simplification and symbolization. Selection is to limit ones concern to those classes of information that will serve the map purpose i.e. .to get some useful information. Classification is the ordering, scaling, and grouping of features by their attributes and attribute value. Techniques used at this stage are collapsing (loss of dimension) or typification (retain essence of the pattern). Simplification is an operation to determine important characteristics of feature attributes and eliminate unwanted details .Techniques used at this stage are elimination or smoothening and the purpose is to increase legibility at chosen scale Appropriate generalization results in efficiently structured spatial message.

Symbolization is a process of graphically coding information and placing it into a map context with a purpose to use graphic marks to encode the information for visualization and it is most important process in preparation of thematic map. Each process results in a reduction of the amount of the specific detail carried on the map, yet the end result presents the map reader with enough information and express the salient character of the phenomena mapped. It also leads to simple visual images which are more apt to remain in the map user's memory.

The second transformation involves the readers registering these marks and deducing the spatial information message from them. This process is complex and involves the human nervous system. Map use comprises of reading, analysis and interpretation. In map reading, the viewer looks at a map and determines what is displayed and how map maker did it. On closer inspection, the map user begins to see the different patterns; this begins thoughtful analysis .Finally, a desire to explain these pattern leads to map interpretation. In this last stage causal explanation (probably not displayed on the map) is sought by the map user .At this stage appropriate legend and inset map (base map) is required.

Classification of Thematic Map

On the basis of type of data thematic map can be classified into two groups- Qualitative and Quantitative. Qualitative thematic maps show the spatial distribution or location of kind or nominal data, for example, the mapping the distribution of the principal oil fields. From this map one can determine only the areal extent not the amount. On the other hand, quantitative thematic maps display the spatial aspects of numerical data. In most instances, a single variable such as rice, literates or income, is chosen and the map focuses on the spatial variation of those features. These maps may illustrate numerical data on ordinal or interval or ratio scale.

On the basis of type of symbols used, thematic map can be classified as Point, Line and Area mapping. Point mapping deals with the point symbols and can be qualitative or quantitative in nature. Qualitative point mapping needs less attention. Use of proper or appropriate symbols to

represent each discrete element of a geographically distributed phenomena is the only precaution needed in case of this type of mapping .Quantitative point mapping such as dot distribution map which is also known as frequency mapping, though simplest case of such mapping, needs special care.

The success of such maps depends on proper selection of size of dots, unit value assigned to a dot, and location of the dots. The ideal dot map would be at a scale that allowed for one to one mapping i.e. one symbol for each mapping element. In most dot mapping circumstances, a many to one situation exist. Size of dots should neither be too small nor too large. If the dots are too small, the distribution will appear sparse and insignificant, and the pattern will not be visible. If the dots are too large, they will give an impression of excessive density that is equally erroneous. Similarly, the unit value of the dot should not be too small, so that the map gives an unwarranted impression of accuracy nor should be too large so that the distribution lacks any pattern or character. Dot value and size of dot should be selected in such a way that it gives a pattern or character to the distribution i.e. the dots should just begins to coalesce in the statistical area that has highest density of the mapped value and there should be only two or three dots in the statistical area that has the least of the mapped quantity. At the same time dot values should be easily understood eg. 500, 1000.Theoretically, dot should be located as close to the real distribution as possible using the centre of gravity principle. At the same time, related distribution maps should be used as filters to control the placement of the dot. Map legend should contain two components: A statement indicating the unit value of a dot and a set of at least three square or other areas that illustrate three different densities taken from the map.

In case of the proportional point mapping which is also called graduated or variable_point symbol mapping, circle is the most popular forms probably because of its compact size and ease of construction. Other includes the square, the triangle, sphere, cube, prism etc.Variations in the actual area of the circles are made uniformly comparable to the number they represent. The unit radius value may be any desirable unit but it should be selected in such a way so that the largest circle should not be 'too large' and smallest not 'too small' .In simple proportional circle case the area of the circles should be in linear proportion to the size of the number they represent. Recently, apparent or psychological scaling is been widely used to eliminate the problem of under estimation of larger circles. The circles can also be drawn on range- grade scale or ordinal scale
Line mapping portrays attributes of features conceived as lines such as coast lines, rivers, administrative boundaries, all kinds of flow or movements between locations etc. Variable line width (size) and value (colour) are used to symbolize quantitative line features. Size is more effective than value (colour) and are portrayed on range-grade or ratio scale .Chroma or value are use only to enhance the size.

In case of area mapping, features are conceived as area. Choropleth mapping is the most popular form of area mapping. It is a class of map which depicts average value per unit of area over some administrative region for which statistics are available such as density of population, percentage of land under cultivation. The success of this type of mapping depends on the knowledge of geographic phenomena, size and shape of the enumeration units, the class limit determination and symbolization. Determination of the class limits depends on type of the data and is the most

important step in choropleth mapping. Class limits should be so determined that it maintains the homogeneity within the class and heterogeneity among the classes. Symbolization should be in accordance with the perceiveability of human eyes. Recently use of computers has made the task easier.

On the basis of the number of themes to be portrayed on the map, thematic map can be classified into single theme map and multivariate map. As the name suggests, single theme map represents one theme and is common and simple and has a long history whereas Multivariate map depicts more than one theme. There are four methods to show multivariate data such as combine mapping, multivariate point symbol mapping, composite index and multiple display method .In case of combine mapping method two or more methods are combined such as choropleth and point map. In this case map is conceptually simple, useful for displaying a few variables (two or three) and helpful for inspecting individual distributions but its readability decreases as the number of variables increases. Besides, it is difficult to convey the relative importance of the various types of information on such maps. In case of multivariate point mapping one symbol simultaneously displays several variables, but such maps are constrained by visual limitations of human eyes. Besides, estimating the relative length or area within each segment is not easy. In case of composite index map or composite variable map, several data variables are combined into single numeric index, such as health index, seismic risk index etc. Here distinct legend and explanatory notes on the maps are essential. In addition, factors used to define the index and weighting of factors may not tally with the expectation of the user. Another method to display multivariate data is multiple displays. Multiple displays can be generated in either constant format displays, showing series of structure that are used to depict changes, or in complementary formats display method where maps are combined with graphs, plots, tables, text, images, photographs and other formats for the display of data. Most important advantage of this type of map is that they are better for comparing datasets if there are lots of complexities in the displays, but its effectiveness depends on ones ability to understand each format.

On the basis of motion, thematic map can be categories into static and dynamic. For better understanding of changing nature of geographical phenomenon, dynamic maps are of a great help. Ever increasing use of computers had increased its popularity but very strong intuitive power is essential for understanding the changing pattern .This can be solved by providing enough time to see the map and review them .For this display or replay control is required along with prominent legends and clear time passage indicators. No doubt, interactive control over the display of the map animation is the best solution to avoid misinterpretation of the map.

Conclusion

The demand for thematic map has gradually increased and is likely to get further enhanced in the coming years. A necessity has arisen for detailed data or thematic map to facilitate realistic planning at panchayat or mouza level. Geographical Information System has made the aspiration of having a real time map at frequent intervals a possibility and at the same time being an integrated system it has the capacity to correlate data developed in diverse areas including realm of remote sensing. A hard copy of any particular map can be obtained as and when required, hence

the cost for printing and storage of special thematic map has reduced considerably. If the knowledge has to be utilized in the planning process, regular updating of the process of map making, in accordance with the state-of- the-art technology, is a must.

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