Design Issues on Context-Based Cartographic Communication Using Extended Visual Variables

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Abstract:

Visual variables are the fundamental notion for the transcription of information or data into visual representation (Bertin, 1967). But if we introduce the notion of manipulation and communication of the visual representation, various situations will appear (Morita, 2011, 2018). Nowadays, we use many context-based cartographic communications in our information society using a network system, computer and mobile devices. In this context, information and communication are driven dynamically in response to the necessity of one's activity in the real world. In cartographic communication, there are two levels of context. One is within the cartographic representation: the relationships between cartographic symbols on a map and the figure and background composed of symbols. The other context is map use: the relationship between a map and its surrounding environment in a specific situation of map use. Cartographic symbols are represented through the use of visual variables. But in context-based visual communication, visual variables have to be combined with other notions of visual manipulation for efficient representation. In the case of, for example, the scale selection, the synthesis of different visual variables, and the use of ideogrammatic symbols, complementary guidelines − especially regarding what you should not do − are needed for the practice of design process. What are the elements to be considered to this end?

If the scale of map has to be changed, the problem of what is called 'generalization' will appear. The difference between zoom in/out and a scale change of more than ten times should be well recognized. In the latter case, signification of what is being represented might be changed. Name placement also has the same character. Each name has its own territory and they are arranged in a hierarchical structure. The most common inconvenience is the overlapping and congestion of symbols and letters. In a bad case, it is impossible to extract meanings from the dumpling zone, furthermore meaningless areas become no more than "noise"? Very often we meet this phenomenon in the application software of web-mapping (Figure 1).

Figure 1: Overlapping and congestion of symbols (source: Seismic intensity map by Yahoo)

If the symbol has to incorporate both quantitative and qualitative meanings, this is possible by using composite symbols of visual variables, size and color, for example. But what about other combinations? For relief representation, contour lines is a basic method but layer tint is also used. In the latter case, the contour band is tinted by the combination of colour and value. For colour selection, it is necessary to have a design policy the section of which should be emphasized. In Tanaka Kitiro's method (Tanaka, 1950), the contour band is shaded by lighting from the upper left (Figure 2). The shading uses human intuition to perceive the concave and convex of a relief, which contributes to the understanding of the basic context of spatial structure.

If the symbol is nominal or qualitative and to minimize the action of having to refer to the legend, ideogrammatic symbol could be useful instead of abstract ones. But the design of ideogrammatic symbols depends considerably on cultural tradition as well as the surrounding physical environment. Symbols of industrial equipment are rather similar − a wind power plant (Figure 3), for example − but cultural places, such as religious sites, are different in each country. Since there might not be a universal solution, it is desirable at least to know

Figure 2: Contour line (left) and shading by Tanaka's method (right) (source: Logo of ICC2019Tokyo)

Figure 3: Symbol of wind power plant
(source: Topographic map of GSI)

what others do. If we can establish an intermediate language for each symbol, it might be possible to translate instantly between symbols using a symbol dictionary through a system.

In visual variables, the principal notion is developed in the form of a matrix composed of six variables − size, value, texture, colour, orientation and shape − and three geometrical characters: point, line, and zone. With this, the characteristics of abstract symbols are described. But if we introduce the notion of scales, composite symbols, and ideogrammatic symbols, elements of context and design need to be considered in order to build a map quickly and for it to be easily understandable.

References

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