

CARTOGRAPHIC IMAGE AND ENGINEERING PSYCHOLOGY

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Abstract

The process of apprehending the presentation of maps is tested from the standpoint of the theory of reverberation and engineering psychology. The work of the visual analyzers and the formation of an imaginary map in human consignation are described. The transformation of the map from a material result of cognition into an object of knowledge is carried out on the basis of complex physical processes. The application of certain methods of engineering psychology for visualization the images of maps are suggested based on analysis and comparisons with the aim of establishing optimum sizes forms colors structures lines and combinations of map combinational methods and symbols and then the pictural methods for certain conditions of using the maps. In order the reader of the map to establish without hesitation the belonging of neighboring elements to certain degrees of the scale, it is necessary to ensure a difference between the individual degrees. The differences should not significantly exceed the operational threshold, as reading fatigue then occurs. There are not only optimal values, but also optimal zones in which the distinction between individual characters or color degrees is most accurately perceived. The purpose of this research is to establish these sizes, shapes, colors, structures, patterns, and combinations of cartographic characters. These methods and combinations between them shape the map and ensured optimal perception of map information.

Keywords: maps, consignation, psychology, reverberation, visualization, perception

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The result of the cognitive activity of man, objectified in the maps, becomes the object of further mental activity. The interconnection of ideas and concepts and the cartographic image makes them relatively independent of the thought activity of the compiler and of the empirical given content of the cartographic phenomenon.

Cognition is realized through such psychic processes as sensation, perception, representation, and thinking. An essential hour of the process of perception of information is the formation of a psychic pattern - the formation of a subjective reflection in the human consciousness of the properties of the object of knowledge.

When getting acquainted with the map, the reader initially builds a psychic image of the map itself (the so-called thought map), performs subjective reflection of the cartographic image. This image, the object of further mental activity, is the basis for establishing properties, relationships and regularities for extracting information about objective reality. The map, as a model of reality and as a material body, is obtained as a result of cognitive activity, but in the hands of the reader itself becomes an object of knowledge.

Each card is intended for a specific circle of users. Most maps are multi-purpose and can be used by different readers/users. Depending on the purpose, the conditions of use and the nature of the depiction, the pictorial means for its compilation are also selected. Practically, the map offers differences between quantitative and qualitative characteristics of individual objects, 1 phenomenon or combinations of phenomena in different areas of the Earth's surface or some other territories may be on planets, Cosmos. As means of transmission, differences between color, size, density, pattern, font, load and various other combinations of conditional signs are used. The wider use of cartographic forms and technical means for presenting information on the screen has caused numerous studies on the regularities of visual perception. The design of systems for displaying information on screens is virtually impossible without knowledge of the psychology of perception of sign information by the operator/user. On the other hand, the achievements of engineering psychology can and should be offered in the development of the cartographic imaging tools themselves. Once the card reaches the user, it must transmit the information contained in it. Choosing the right expression form that increases reading is an important point in the process of creating the map. Finding such forms of expression should be based on the knowledge of the regularities in the formation of a mental map and the creation in the

consciousness of a person. The apparatus of research and its methods, which everyday psychology uses, make it possible to study and know these regularities.

The physiological basis of the formation of the mental model is the work of analysts - nervous organs, with the help of which a person carries out the analysis of irritations. For the reader of the map, as well as for the cartographer, the most important is the visual analyzer - the eyes. A baseline degree and the most elementary form of subjective reflection is the sensation that occurs with the immediate impact of the stimulus on the analyzer. Based on sensation, the more complex mental processes take place – perception, vision, etc. By accepting information, a person analyzes and processes it through psychic activities - memory and thinking. Human memory has 2 main forms: in a short time - immediate and operative - long-term. Almost all information is stored in the immediate memory, but its storage time does not exceed a few seconds. In RAM, the necessary current information is stored for the time it takes to perform a certain action. It could be seconds or minutes. The translation of information from the immediate to the RAM is accompanied by a selection according to criteria determined by specific tasks. In this translation are inevitable and losses due to various external factors. Depending on the specific tasks, the reader of the map must make sense of the cartographic image and make a certain decision. Of great importance is the level of operational thinking of the reader. The next transition from operational to long-term memory occurs with further selection and reorganization of information.

The reception of information by the reader of the map can be seen as the formation of a perceptual (sensual) image. The latter represents a subjective reflection in the human consciousness of the properties of the influencing object. The formation of a perceptual image takes place in several degrees: 1. detection degree of perception, in which the reader separates the object from the background, but cannot judge its form and purpose; 2. differentiation - a degree of perception in which the reader distinguishes 2 objects located 1 next to another or 2 states of 1 and the same object and separates details from the object; 3. knowledge of the degree of perception at which the reader gives off essential features of the object and assigns it to a certain category.

The duration of these stages depends on the complexity of the perceived signal or how good the card is for its perception.

To choose the optimal system of cartographic imaging means, it is necessary to know the characteristics of the visual analyzer and the mental processes in the formation of a subjective image. The basis of the perceived perception of visual information is light energy, and the receptor – the eyes. Man perceives through his vision shape, color brightness and movement of objects. Of course, there are also visually impaired, not even seeing people for whom there are cards with Braille. The possibility of visual perception is determined by energetic spatial information and temporal characteristics of signals. The totality of these characteristics and their quantitative expressions determine the visibility of the object and the subject receiving it.

The characteristics of the visual analyzer are subject to certain regularities. Their optimal quantitative values, established empirically, are also known. When examining cartographic images, it is quite possible to define a characteristic for each specific case. After comparison with the optimal values, these size, shape, pattern, color and combination of cartographic conditional signs and pictorial methods can be selected to ensure the best perception of spatial information.

The signal for the eye has several main characteristics.

Mean duration of visual fixation in ms	
Tasks	Fixation time
Reading letters or numbers	310
Search for symbols	300
Search for simple geometric shapes	200
Getting to know a situation with signs	640

The analysis of the data showed that in our country when designing learning maps, the peculiarities of visual perception are not sufficiently taken into account, specifically in terms of visual acuity and visibility of objects from different distances. Of interest are the studies on the resolution of the eyes in terms of colors and their relationship with the color design of the map, as well as the relationship between the color design of the map and the conditions for its use. The cited scientific works showed that there is a certain interest in the issue under consideration on the part of the cartographers. In practice, however, the design and compilation of maps is carried out without taking into account the various features of visual perception. Research in this direction would contribute to a significant increase in the quality of cartographic works.

CONCLUSIONS

1. The colour spectrum of the mapping image shall be appropriate to the sensitivity range of the eye. It should be borne in mind that the sensitivity of the visual analyzer to the middle of the spectrum - yellow green color is greatest. The image executed in these colors will stand out. This property allows correctly to be transmitted the mutual subordination of the individual elements of the content of the map, their gradation and the classification scheme.
2. In order for the reader of the card to establish without hesitation the belonging of adjacent elements to certain grades of the scale, it is necessary to ensure a difference between the different grades exceeding the operational threshold of sensitivity. In this regard, optimal sizes, shapes, colors of conditional signs should be determined for each degree, so that differences are perceived without difficulty. At the same time, the differences should not significantly exceed the operating threshold, as then reading fatigue occurs. There are not only optimal values, but also thermal zones where the difference between individual signs or color degrees is most accurately perceived.
3. There are studies on the perception of a card image, in which the background has greater brightness than the elements of the content. Reading in contrast when the sign is darker than the background is in some cases more favorable.
4. Limiting immediate memory with 7 + -2 simultaneously perceived signs/grades of the scale is a necessary consideration when assessing the load on the map and when developing the classification scales for content elements.

Using the methods of research adopted by engineering psychology, one can evaluate many conditions for the perception of the image itself. The aim of such a study is to establish those sizes, shapes, colours, structures, drawings and routines of cartographic conditional characters, those cartographic methods and combinations among them, this map shaping which would ensure an optimal perception of cartographic information.

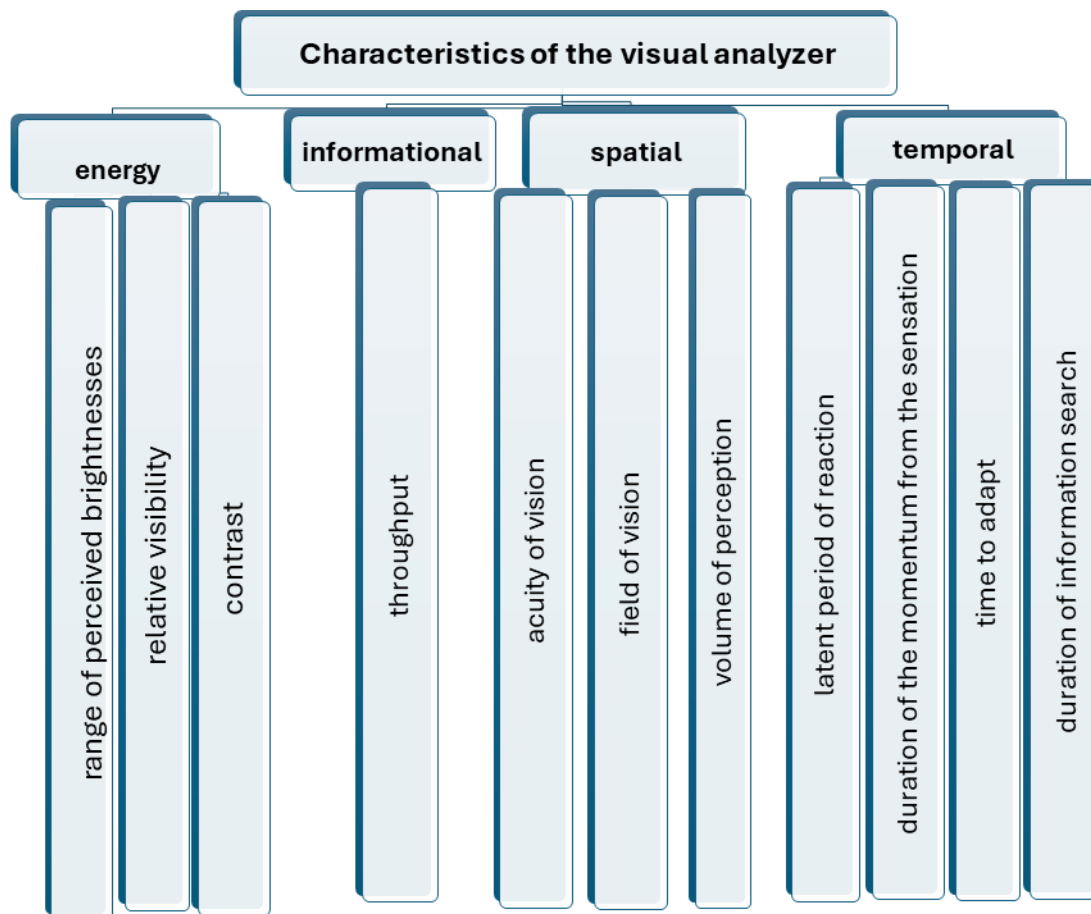


Figure 1. Classification of visual analyzer features

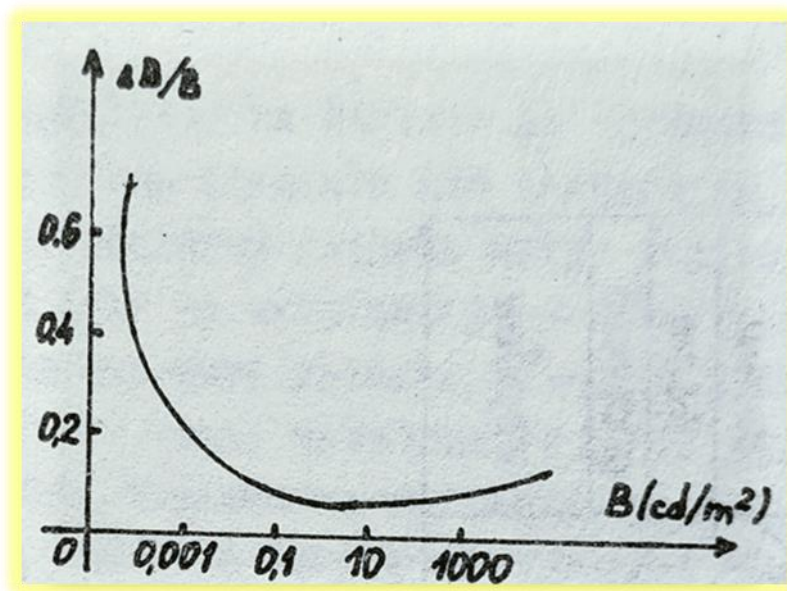


Figure 2. Dependence of the differential sensitivity threshold on the output brightness level

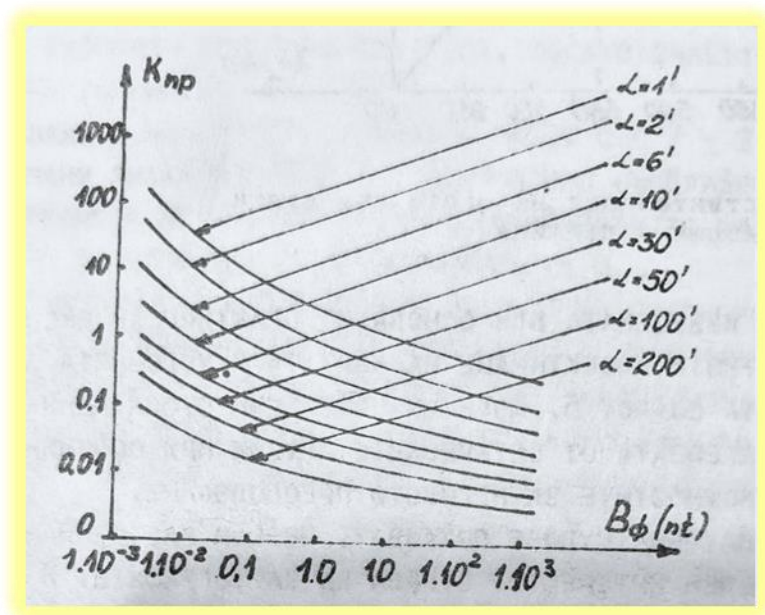


Figure 3. Dependence of threshold contrast on adapting brightness and dimensions of objects

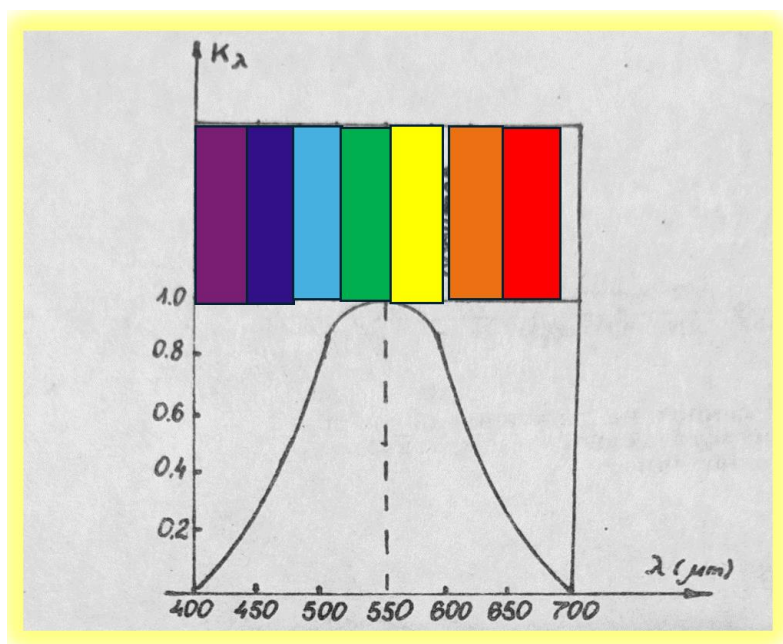


Figure 4. Sensitivity of the eye to waves of different lengths colors

REFERENCES

- 1.Cohen, B. Visual acuity and the shaping of learning maps, 1977.
2. Kaliyev, K.A. Proektirovanie i obrazhenie kartov, 1987.
3. Smolyarov. A.M. Information Display Systems and Engineering Psychology. Biography
- 4.Penev,P.T. Cartography.2013.