

**Theories of color vision**

Trichromatic theory can explain the anomalies of color vision. So, people with normal color vision are called normal trichromats.

Monochromats are people who are generally devoid of functioning cones and see no color, but only light and shadow. They understand better in low light, and at medium and high light levels, they feel uncomfortable.

Opponent's theory of color vision: In the same period, Goering proposed the so-called. an opponent's theory of color vision based on a variety of subjective observations of color perception. These observations included the perception of color tone and simultaneous (simultaneous) contrast, the so-called post-images and color vision anomalies

At the end of the 19th century, the so-called trichromatic theory of color vision, based on the work of Maxwell, Jung and Helmholtz. They suspected the existence of three types of receptors that are sensitive to the rays of the approximately red, approximately green and nearly blue spectral regions. "Trichromatic theory suggested that three types of receptors form three images of the surrounding world, which are then transmitted to the brain, where the signal ratios of each image are compared, based on which a color sensation arises" (Niall, 2017). The trichromatic (three-receptor) nature of color vision was not in doubt, but the idea of ​​three images sent to the brain turned out to be untenable and could not explain several visual phenomena. If one group of cone receptors does not perform its functions, this is dichromatism. People with malfunctioning cones that are sensitive to red are called protanopes. Accordingly, deuteranopes are those whose receptors do not function.

There are three different types of receptors (cones) responsible for color vision. Each of these three types of receptors has sensitivity in a wide range of light wavelengths (the light wavelength is associated with the sensation of a particular color). At the same time, the different types of cones specialize in the perception of specific colors (green, red, blue). Some have the best sensitivity in one part of the wavelength range, others in its other region, and some in the third. Light of a specific wavelength stimulates each of the three groups of receptors to the same degree. The patterns of excitation of the picture, combination, the ratio of excitations give sensations of different colors and shades.

**References**

Niall, K. K. (2017). On the Relation of the Tetrachromatic Theory to the Trichromatic Theory. In

Erwin Schrödinger's Color Theory (pp. 167-185). Springer, Cham.

Pattern recognition theory

The methods of the theory of pattern recognition are widely used to solve problems such as recognition of alphanumeric information, weather forecasting, establishing medical diagnoses, analysis of sound recordings, etc. An essential property of pattern recognition methods is that a complete knowledge of the probability distribution of data is not required. Only a small number of measurements are available, and therefore it is impossible to determine significant statistical distributions, then nonparametric methods can be used. The theory of pattern recognition is a relatively new and not yet fully developed section of cybernetics. It is confirmed by the fact that currently, research in the field of pattern recognition is often heuristic in nature. (Devijver & Kittler, 2012

Historically, the theory of pattern recognition developed in two directions: deterministic and statistical, although most often, they cannot be strictly distinguished. The deterministic approach includes various methods: empirical, heuristic, which is based on common sense. It is more or less successful modelling of actions carried out by the human brain; mathematically formalized, for example, based on the model of generating objects (realizations) of one or another image. In this case, a different mathematical apparatus is used (mathematical logic, graph theory, topology, mathematical linguistics, mathematical programming, etc.).

In the process of developing recognition theory, various approaches and the applied mathematical apparatus are intertwined that the classification of multiple algorithms by the methods used is conditional and ambiguous. Nevertheless, in this course, two sections are distinguished: deterministic methods and statistical methods. It is done mainly for pedagogical reasons. Deterministic methods (primarily empirical) are quite obvious but easier to perceive. However, statistical methods is methodologically advisable to start presenting the material from them.

**References**

Devijver, P. A., & Kittler, J. (Eds.). (2012). Pattern recognition theory and applications (Vol.

30). Springer Science & Business Media.