http://mmg.tversu.ru ISSN 2311-1275

Mathematical Modelling and Geometry

Volume 6, No 1, pp. 21 – 36 (2018) **Full text**

Numerical modeling of color perception of optical radiation

K. P. Lovetskiy [1,a], **L. A. Sevastianov** [1,b] **and N. E. Nikolaev** [2,c]

[1] Department of Applied Probability and Informatics, Peoples' Friendship University of Russia (RUDN University), 6, Miklukho-Maklaya str., Moscow, 117198, Russia

[2] Institute of Physical Research and Technologies, Peoples' Friendship University of Russia (RUDN University), 6, Miklukho-Maklaya str., Moscow, 117198, Russia

e-mail: [a] lovetskiy_kp@pfur.ru, [b] sevastianov_la@pfur.ru, [c] nikolaev_ne@pfur.ru

Abstract. The concept of color is closely related to how a person perceives light. It can be said that the perception of light is formed by the human brain as a result of the analysis of the light flux falling on the retina of the eye. Color is the result of the interaction of the light flux and the observer (or recording device). The basis of the mathematical description of color is the experimentally established fact that any color can be represented as a mixture of certain quantities of three or more linearly independent colors. The paper gives a description of four color spaces used in the analysis and design of light reflecting, light-transmitting and light-emitting devices. Such devices include liquid crystal displays (LCD), solar panels, reflective and sunproof glasses, as well as polarized glasses. Numerical calculations (carried out using the MorphoVision software package, developed by the authors of the paper) are presented for the color coordinates of thin-film multilayer structures consisting of several layers of isotropic and anisotropic materials of different thicknesses.

Keywords: color space, color coordinates, reflectance characteristics, emission spectrum, calculation of color coordinates of a multilayer structure

MSC numbers: 68N30 ,

References

[1] Robertson A.R., Staniforth A., Gignac D.S., McDougall J., *A Computer-Controlled Photoelectric Tristimulus Colorimeter. NRC Report Pro-387*, Ottawa, 1972.

[2] http://www.cie.co.at/publications/disc-version-cie-photometric-and-colorimetric-data-publ-182-86-s001-and-s002-tables

[3] Wyszecki G., "Colorimetry", Chapter 9 in *Handbook of Optics*, G. Driscoll, ed., McGraw-Hill, 1978.

[4] Wyszecki G., Stiles W.S., *Color Science: Concepts and Methods, Quantitative Data and Formulas*, Willey, 1982, pp. 130–175.

[5] http://dba.med.sc.edu/price/irf/Adobe_tg/color/light.html

[6] https://www.stellarnet.us/

[7] https://www.avantes.com/products/software

[8] https://goochandhousego.com/