Coloristic levels of perception of an art object in the interior space

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ABSTRACT

In the context of increasing attention to the creation of a comfortable and functional-aesthetic space of various types of interiors, as well as to the visual effect that arises during their perception, the identification of effective design factors is becoming increasingly relevant. Creating a harmonious color scheme for the interior is one of the main aspects in ensuring comfortable visual perception, and consequently, favorable conditions for human life. The inclusion of coloristic works of fine art (various types of art objects) into the interior is an essential aspect in solving this issue. This article identifies one of the factors contributing to high-quality and effective design – the coloristic levels of perception of an art object in the interior space are identified, analyzed and formulated.

In the course of the study, the basic properties of color combinations are systematized and structured, based on interdisciplinary sciences, such as physics, psychology and fine arts, which influence the perception of various types of art objects in the interior. Based on them, it was determined that coloristic levels of perception from maximum, intermediate to minimum depend on a number of their main components, such as: 1) degree of color contrast (in degrees); 2) combinations and connections of colors; 3) signs of associative color scheme. As a result of the research, an innovative approach was developed, necessary in creating a specific space corresponding to a creative idea, in which the coloristic solution of art objects and the interior are in mutual harmony. The results of implementing the developed approach are demonstrated using examples of creative projects of design students from Kyiv National University of Construction and Architecture (KNUCA), Ukraine. The study demonstrates examples of completed work that confirmed the effectiveness of the developed approach in optimizing the process of choosing their color scheme, taking into account the coloristic relationship with the interior. Thanks to the use of this approach, the art objects were harmoniously integrated with the interior space, perceived as an integral part of the overall design and responding to the conceived creative idea.

Thus, the proposed approach can be useful from a theoretical point of view as a basis for studying, establishing and supplementing the various components of coloristic levels of perception. It can also serve as a tool for optimizing the process of determining the color scheme of the interior space in conjunction with various types of art objects.

KEYWORDS: Art object, Coloristics, Interior space, Color perception, Color contrast, Design.

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1. Introduction

Since ancient times, polychrome has been one of the traditional and effective means of expressing various types of fine art and interior design, which have always been an integral part of one whole space, mutually complementing each other. When creating objects of fine art and designing an interior, it was extremely important to take into account the principles of creating color combinations and their interaction in the formation of the overall color scheme (Pila and Gura, 2014).

A modern interior is a multifunctional space in which aesthetics and functionality are harmoniously combined, creating a comfortable and efficient environment for living and working (Hassanein, 2020). The use of a coloristic art object in the space provides an opportunity to create a specific mood, evoke or change an impression, and shape a particular image in the interior (Abulawi, 2023). At the same time, the perception of an art object is greatly influenced by the total volume of color space. In it, the degree of emotional impact on the viewer can change – rise or fall, depending on the overall specific color scheme used. Accordingly, the choice of the color scheme of the art object and the interior must be justified and correspond to the functional purpose and theme of the interior space, since the illogicality and unreasonableness of this factor can cause visual discomfort.

Scientists in the field of psychology and aesthetics have come to the conclusion that the main link between behavior and the coloristic interior environment is an emotional reaction (O'Connor, 2011; Pallasmaa, 2014). Goethe discovered that contrasts between different colors can enhance their impact on emotional perception (Goethe, 1840). Kandinsky, on an emotional and empirical level, sought to go beyond the field of the painting and enter the coloristic space to form it using pictorial means, inviting the viewer to try to go inside the pictorial field (Kandinsky, 1946).

Modern authors, drawing on classical works, confirm that the use of contrasting colors with a rich color scheme not only enhances the aesthetics of the space but also has a psychological impact on users, improving the clarity and functionality of the environment (Tsaqif and Hanafiah, 2020). Research shows that color, with its associative and functional-aesthetic capabilities in the interior environment, has a significant impact on various emotional reactions during perception (Ulusoy, Olgunturk and Aslanoglu, 2021; Yildirim and Hidayetoglu, 2011).

Global artistic practice reveals the potential of color to create profound emotional and visual effects, but also emphasizes the complexities and subjectivity of color perception, which depend on cultural and individual factors. By exploring how the brain works and the influence of art on artists' color palette choices, Bevil suggests that while artwork is not scientific, it is valuable for understanding how its context shapes our color perceptions and emotional responses (Bevil, 2012).

Today, it is relevant to use mathematical and information methods, as well as the use of color atlases and colorimetric systems in working with color schemes for interiors and works of fine art. Incorporating individual differences and long-term adaptation effects into atlas system models improves color perception predictions for humans. In addition, a combination of psychological experiments and information technology has led to the development of physical color characteristics that can predict color harmony with high accuracy using machine learning (Pertica *et. al*., 2023; Smet *et. al*., 2021; Wang *et. al.*, 2022). The use of artificial intelligence helps optimize these processes. For example, AI could be used to analyze the color statistics of original paintings and identify those that are likely to be favored by observers from different cultures. This could be useful for curators and collectors in making informed decisions about how to shape an exhibition spac (Nakauchi *et. al*., 2022). Accordingly, innovative capabilities allow for nuances of color perception to be taken into account, can ensure high accuracy of color work and standardize results.

However, the issues of perception of art objects in the interior in the context of using the possibilities of coloristic levels remain little studied. In this regard, it becomes important to define such levels that would make a significant theoretical contribution from a scientific point of view, as well as in the field of color practices. Developing tools to analyze color relationships can improve the interior design process, allowing designers to more accurately predict and control color effects and create more harmonious and efficient spaces.

The purpose of this article is to study, analyze, systematize and establish various coloristic levels of perception of an art object in the interior space.

2. Materials and methods

2.1. *Used methods*

The research methodology included:

A method of critical analysis of modern theoretical and practical materials, which made it possible to identify interdisciplinarity in approaches to determining the coloristic role of works of art in the formation of color schemes and perception of interior space.

A method of systematization based on an integrated approach to the material being studied, which made it

possible to organize and summarize the information materials used in the study in the context of the topic, and to identify the necessary components in solving the problem. The systematization results were presented in a visual structural model and table, as well as graphic images.

The experimental design method was used to confirm and record the effectiveness of using the developed approach in design decisions regarding the conditions of a specific situation. The results of the study were introduced into the applied design of educational assignments for students at the Kyiv National University of Construction and Architecture (KNUCA), Ukraine, under the guidance of the author of the study. The experiment involved undergraduate students, the total number of students was 184. The paper presents the best works that best meet the research objectives. The RGB color wheel was used to conduct the experiment. The experimental part incorporated findings from the author's previous studies, which focused on categories of artworks across various stylistic directions and the potential of the color surface of art objects to harmonize with the interior's color scheme and content (Pilipchuk and Kolomiiets, 2019; Pylypchuk and Polubok, 2022; Pylypchuk, 2024).

The method of visual analysis of completed design solutions confirmed the effectiveness of using the developed approach. This study included the best examples of developed design solutions.

The research also involved the author's many years of professional experience in the field of fine arts and design.

2.2. *The main components of the coloristic perception of interior space and art objects*

Color perception is a complex process of processing and converting information, determined by physical and psychological factors. The role of color in a person's orientation in space, the transfer of functional content, emotional and aesthetic impact, as well as the formation of favorable psychological comfort may be underestimated. The main goal of the entire aesthetic and functional system of using color schemes in space is to provide comfort and satisfaction during perception.

This research was based on fundamental work on the study of color in the aspects of its physical and psychological foundations, associative features, various possibilities of color gamuts and principles of contrast, and also took into account modern approaches in this context.

In determining the coloristic levels of perception of an art object in the interior space, the main characteristics of color were taken into account, such as: color tone – the degree of difference in spectral colors (determined by the wavelength of light reflected by the object) (Ostwald, 1969; *NASA*, 2024); color saturation – the degree of its brightness/dimness and lightness – the degree of lightness/darkness (Chevreu, 1890; Rajendran *et. al.,* 2021). It was also taken into account that achromatic colors (white, black and shades of gray) play an important role in combinations and mixing with chromatic colors (all other colors). They allow you to create contrasts, highlight accents and add depth to the color scheme (Ostwald, 1969).

An important aspect of the study was the associative capabilities of color and various emotional reactions of a person when perceiving it. For example, the Luscher color test for use in assessing the psychological state and profile of the patient (Flaviani, Plutino and Rizzi, 2023; Luscher, 1971). In this context, the associative possibilities of color in the polychromy of the general interior space were studied, with the help of which the figurative and aesthetic characteristics of the interior can be enhanced (Frieling and Auer, 1954; Itten, 1981; Yildirim and Hidayetoglu, 2011).

Accordingly, the psychological reaction (stimulating or calming) to color in a person's internal space is associated with the characteristics of color: the concept of tone, brightness, saturation, as well as associative characteristics of color – warmth/coldness of the color scheme.

3. Results

3.1. *Rationale for the Results*

The study took into account such well-known scientific facts as: complementary colors located on opposite sides of the color wheel contrast with each other, color combinations located next to each other on the color wheel have nuanced relationships, and different color schemes can evoke different associations (Itten, 1981; Ostwald, 1969).

As a result of the study, based on the analysis and structuring of the main characteristics of the coloristic relationships of the interior space and the art object, the main coloristic levels of perception were identified: maximum, intermediate and minimum.

Each level was based on the measurement of the corresponding angles, which were determined relative to the arrangement of spectral colors, the range of contrast or nuance combinations. For this purpose, the generally accepted modern color system (according to the Ostwald chromatic circle) was taken.

The result allowed us to form a visual model depicting three areas with angular ranges, each of which corresponds to a certain coloristic level of perception (Figure 1).

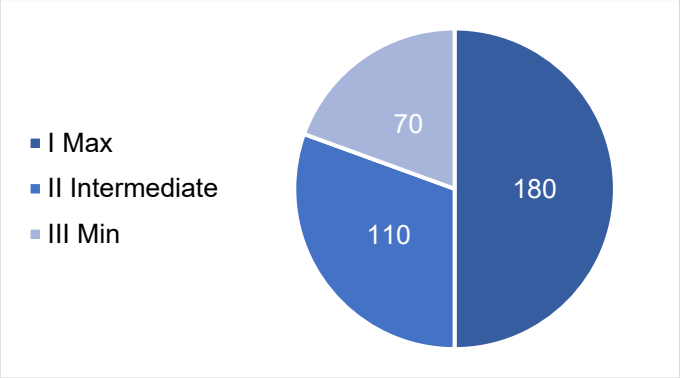

Fig. 1. Visual model of coloristic levels of perception in degrees (developed by the author)

Table 1 formulates the levels of coloristic perception, the main components of which are the degree of color contrast, the combination and connection of color schemes, as well as their associative characteristics.

№	Coloristic levels of perception	Main components of color levels		
		Degree of color contrast (in degrees)	Combinations and connections of colors	Signs of associative color scheme
I	Max	110°–180°	1) Chromatic; 2) Chromatic – Achromatic	Warm – Cold
II	Intermediate	70°–110°	1) Chromatic; 2) Chromatic + Ahromatic	1) Warm; 2) Cold; 3) Mixed
III	Min	<70°	1) Chromatic; 2) Chromatic + Achromati; 3) Achromatic	Neutral

Tab. 1. Coloristic levels of perception of an art object in the interior space (developed by the author).

Note to Table 1:

I. The first level of coloristic perception is Max.

- The degree of color contrast is within the range of 110°–180° color wheel. In high contrast complementary colors of the spectrum.

- Possible combinations and connections of the color scheme are based on: 1) Chromatic scale in combinations of saturated pure spectral colors and their connections with maximum color contras; 2) Chromatic scale in maximum contrast to the Achromatic scale (connection of saturated pure colors and their mixtures in contrast with whites, blacks and shades of gray in their maximum gradation).

- The associative effect of the color scheme is in opposition – Warm to Cold colors.

- Features of the first coloristic level: maximum expressiveness with pronounced contrast, active perception of the color gamut, dynamic composition, high chromatic activity, increased requirements for the balance of the color composition.

II. The second level of color perception is Intermediate.

- The degree of color contrast is within the range of 70°–110° color wheel. In the average contrast of complementary colors, or in the contrast of closely spaced colors in the spectrum.

- Possible combinations and connections of the color scheme are based on: 1) Chromatic scale in combinations of saturated pure spectral colors and their connections, but within the same color nuance; 2) Chromatic scale combined with an Achromatic scale (in combinations of medium-saturated pure colors mixed with white, black, and shades of gray in their mid-gradation).

- The associative effect of the color scheme causes a feeling of Warmth/Cold, or a mixed color scheme.

- Features of the coloristic level: average expressiveness of contrast, nuanced perception of the color gamut, average chromatic activity, not expressed dynamism in the overall visual perception, expanded capabilities in the balance of color composition.

III. The third coloristic level of perception is Min.

- The degree of color contrast is within 70° and less of the color wheel. In the convergence of related colors of the spectrum.

- Possible combinations and combinations of the color scheme are based on: 1) Chromatic scale in combinations of weakly saturated pure spectral colors and their compounds, but in color nuance; 2) Chromatic in combination with Achromatic scale (in a combination of weakly saturated pure colors mixed with white, black and shades of gray in their minimal gradation); 3) Achromatic scale (in combinations of mixed colors).

- The associative effect of the color scheme causes a feeling of Neutrality of the color scheme.

- Features of the coloristic level: lack of contrast, the color gamut is perceived in barely noticeable nuanced differences, minimal chromatic activity up to the transition to achromaticity, a feeling of staticity in the overall visual perception, limited possibilities in balancing the color composition.

3.2. *The structure of the experiment*

To verify the developed approach and the potential for practical application of the levels of coloristic perception of an art object in an interior space, an experiment was conducted. This experiment was based on the development of a design project for an interior space with a created and integrated art object. The experiment was carried out in a group of students majoring in “Interior and Equipment Design” at the Kyiv National University of Construction and Architecture (KNUCA), Ukraine, in the practical course “Interior Painting”. The experiment included the simultaneous implementation of two tasks: the development of interior design and the creation of picturesque art objects in their coloristic relationship. When developing a design solution, students examined the main components of the identified levels and completed a practical task regarding the given characteristics of various levels of perception (maximum, Intermediate, minimum), which allowed them to create well-founded design solutions. It was taken into account that the main distinguishing feature of painting from other types of fine art is that the image of form and space, images and actions is constructed exclusively with the help of color. In painting, color is the main means of expression; in other types of creativity, color serves as an additional opportunity to emphasize the expressiveness of the form and content of the work.

Figures 2–4 show examples of the results obtained.

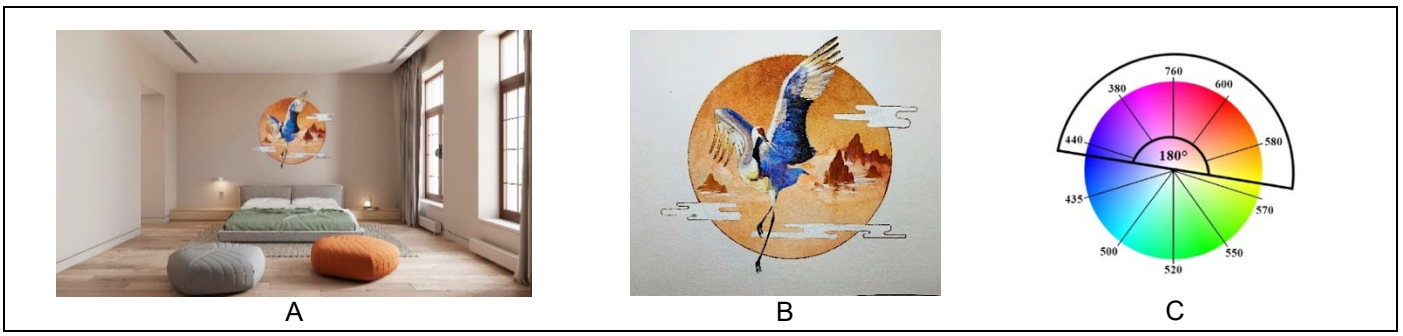

Fig. 2. Example of Max coloristic level of perception. Author Tetiana Bulba, supervisor Oksana Pylypchuk: A – visualization of bedroom design in a living space; B – painting project “Tango with clouds”; C – structural diagram of the color scheme and the degree of color contrast with the maximum coloristic level of perception. (Visual material by the author).

Note to Figure 2:
Coloristic level of perception – Max:
1) Degree of color contrast (in degrees) of the overall space of the interior and art object – 180̊, from blue to orange-yellow spectral range (wavelength approximately 430–575 nm);
2) Chromatic in maximum contrast to the Achromatic scale of the art object and interior space;
3) Associative perception – a Warm color scheme in maximum contrast with a Cold color scheme.

The result, Figures 2(A), 2(B): the effect of expressiveness, contrasting color diversity, stability of impression, active perception of the color range, increased chromatic activity. Significant impact on the perception, emotions and visual impression of a person, taking into account the maximum contrast in the perception of color gamut, lightness and saturation, as well as the associative nature of color compounds.

Fig. 3. Example of Intermediate coloristic level of perception. Author Daria Makarchuk, supervisor Oksana Pylypchuk: A – restaurant interior design visualization; B – project of a painting panel “Melody”; C – structural diagram of the color scheme and the degree of color contrast with the Intermediate coloristic level of perception. (Visual material by the author).

Note to Figure 3:
Coloristic level of perception – Intermediate:
1) Degree of color contrast (in degrees) of the overall space of the interior and art object – 110°, from the violet-purple to the orange-yellow spectral range (wavelength approximately 400–579 nm);
2) Chromatic mixed with Achromatic scale of art object and interior space;
3) Associative perception – Warm color scheme.
The result, Figures 3(A), 3(B): a coloristic symbiosis of the artistic form with the interior space, staticity and unity of the composition with a variety of elements and forms, a sense of identity. A harmonious and balanced atmosphere, ease of perception and an emotionally balanced impression. A variety of shades in combinations with an achromatic range.

Fig. 4. Example of Min coloristic level of perception. Author Nataliia Popeta, supervisor Oksana Pylypchuk: A – cafe interior design visualization; B – project of a picturesque wall painting "Princess Marushka"; C – structural diagram of the color scheme and the degree of color contrast with the Minimum coloristic level of perception. (Visual material by the author).

Note to Figure 4:
Coloristic level of perception – Min:
1) Degree of color contrast (in degrees) of the overall space of the interior and art object – 70°, from yellow to red spectral range (wavelength approximately 570–600 nm);
2) Chromatic mixed with Achromatic scale of art object and interior space;
3) Associative perception – Neutral color scheme.
The result, Figures 4(A), 4(B): coloristic unity of the artistic form with the interior space, static composition, a sense of balance and integrity. Nuanced combinations are distinguished by subtle color differences, common color tone and neutral associative effect, similar properties, and integrity. Neutrality of the gamma, close to achromaticity in light, desaturated and muted colors, with weak color differences. The effect of ease in combining color combinations.

3.3. *Discussion*

The result of testing the developed approach showed that by using the identified levels of coloristic perception, it is possible to balance and harmonize the coloristics of the interior environment and art object, give the space a certain emotional mood and create a unique atmosphere of the visual environment, which is characterized by the presence of inherent visual associations, images, and level of comfort and the degree of harmony. Also, the results of the experimental design showed that the coloristic levels of perception identified during the study can be applied to any design solution, depending on the creative task. Accordingly, the coloristic levels of perception in the interior environment depend on the creative concept, while the color scheme becomes leading in creating a coherent space.

It is important to remember that atlas color systems continue to play a significant role in modern color design, offering certain advantages such as versatility, consistency, accuracy, and predictability. However, they also have several drawbacks: complexity of understanding, limitations in artistic expression, dependence on the device's technical features, occasional discrepancies with human perception, and labor intensity. This study proposes an innovative approach based on the use of color perception levels that can optimize the process of color selection in creative design.

However, we must not forget that the identified coloristic levels of perception, as tools of the proposed approach, are only the starting point in creative activity. Each artist has a unique sense of color, which allows him to create unique palettes and color combinations. Taking this into account, it is worth noting that coloristic levels of perception can vary depending on individual differences in perception and sensitivity to color combinations, and also depend on the conditions of the interior space (lighting, subject content and its reflexive influence, etc.).
Therefore, this issue is promising and requires further research.

4. Conclusions

As a result of the research, an innovative approach was developed, necessary in creating a specific space corresponding to a creative idea, in which the coloristic solution of art objects and the interior are in mutual harmony. The proposed approach is based on the coloristic levels of perception determined during the research and structuring: 1) maximum (with a pronounced contrast of color elements with a high impact on perception, a high level of chromaticity of color combinations and associations); 2) Intermediate (with average contrast of color elements, average impact on perception, average level of chromaticity in color combinations and associations); 3) minimal (with minimal contrast of color elements, low impact on perception, neutrality in color combinations and associations).

A visual analysis of the developed color solutions for the design of an art object integrated into the interior space allowed us to recommend the proposed approach for practical use in any works of art, regardless of style and concept. Accordingly, it can be stated that determining the necessary coloristic levels of perception of an art object in the interior space, even at the initial stages of design and creative work, can significantly increase the efficiency of the creative process.

5. Conflict of interest declaration

The author of this piece of research declares no known conflict of interest with other people and/or organizations.

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Licensing terms

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