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Color Ergonomic Function in Urban Chromatic Plans

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Abstract

This paper aims to present the interconnections between Color and Ergonomics, enhancing the color ergonomic function, and how it may be taken in consideration when elaborating Urban Chromatic Plans that are concerned with the population comfort. On the elaboration of urban chromatic plans, color is usually applied in order to establish a harmony between buildings and their background, often contributing to the environment monotony. However, color has other properties that enable making some elements to stand out from their surroundings, without destroying the pretended harmony. Color, when applied with a scientific criteria, can also act as an identification, or orientation, element accomplishing an ergonomic function that will beneficiate the entire city population.

The cities' population is a combination of people with various needs and different disablements. Therefore, inclusive and ergonomic design should embrace the widest possible range of users, but its issues are primarily focused on people with motor limitations and tend to forget visual disabled people. Though, we must consider that the city population is constituted by an extensive variety of people, with different visual acuities and limitations and, also, by a high percentage of older people, which have more difficulty to see small details and the obstacles that could be present on their way.

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1. Introduction

When designing urban chromatic plans, Color Specialists usually base their projects on the existing environmental colors and the region traditional colors or, in the case of historic cities, on samples of the buildings coating extracts and in file collections that tell the city chromatic and architectonic history. Moreover, on their essays to create harmonic ensembles, the chosen colors tend to be very close or even similar to their background. However, color can have other functions different from merging with the environment.

Color is not a simple element for the environment definition and unification; it is a visual characteristic that stands out from the chaos and complexity of the visual field. It is, also, an easy way to achieve the identification of the different city zones, and to promote the orientation of the population, because color is the objects characteristic which the eye first perceives, even before form or texture. By its properties, color can change visually the size of an object and, also, it can make them appear closer or further away. Color interactions can modify other colors that stand nearby, as well as a color appearance can change under the influence of different illuminations. All this make us consider that color can be an important ergonomic factor that must be taken in account when creating urban plans.

Cities are, generally, a complex of streets, architecture and open spaces that originate confusion and causes difficulties to the orientation of visitors and inhabitants. This complexity aroused the necessity to create networks of elements that would help city users to find their way. On these networks, the signage and the urban furniture elements are included, which need to be clearly seen in order to fulfil their functions.

2. Color perception

«Color is not the property of objects, spaces, or surfaces; it is the sensation caused by certain qualities of light that the eye recognizes and the brain interprets»[1]

«Although the idea of “colour” may seem a simple concept, it conjures up very different ideas for each of us. To the physicist, colour is determined by the wavelength of light. To the physiologist and psychologist, our perception of colour involves neural responses in the eye and the brain, and is subject to the limitations of our nervous system...» [2]. Also, considering its physical properties, color is experienced differently depending on whether it is a direct color, the color perceived from a light source, or a reflected color from a surface, and when mixing colored light, reflected colors, or direct and reflected colors, the results are quite different.

Since the beginning of time color identifies itself with light, being the sun its first known source, and color is the very small region of the electromagnetic spectrum that the human eye can see. Sir Isaac Newton, in 1676, decomposed through a prism the white light of the solar spectrum in a multicolored light beam, recovering the same white light through a second prism. The ensemble of his experiences established the principles for the color additive system, constituted of colors of light, where the primary colors were blue, red and green, corresponding to those perceived by the eye sensors. The process of mixing directly light colored beams is called *additive synthesis* because the colors combination adds light energy, on one or more wavelengths of the light spectrum zones, to the light flux emitted toward the eye by light source, activating the correspondent eye sensors, and the result will be a color clearest then the brighter of the component colors.

The objects color is the result of an absorption and reflection process, where the perceived color is the result from the mixing of the wavelengths that were not absorbed, being then reflected. This mixing process is called *subtractive synthesis*, because the light energy is removed, in one or more wavelength ranges, to the luminous flux reflected by the object toward the eye, that activates one or more receptors of short, medium or long waves. The result of this mixing will always be darkest then its components and, theoretically, the result of the absorption of the three principal colors – yellow, cyan and magenta – is black, the total absence of color and light.

A reflected color can be changed whenever a colored beam insides upon it. Then the color will be dyed by the light beam color as it was painted by a water color.

The color mixing may be achieved by an eye reaction, when different colors are put together and the eye perceives them as one. This phenomenon that is applied, among others, on the pointillist painting, four-color printing, mosaic panels, or even television, is called *partitive synthesis* and the resultant color luminosity is equal to the average of all mixed colors.

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