1 - 2 **Miguel Neiva**

[1]IF-FLUP.Universidade do Porto,
[2]miguel neiva design studio,
Portugal

ColorADD . Color identification system for colorblind people

ABSTRACT

In the most developed countries colorblindness affects 10% of the male population. This handicap incurs limitations as well as uncomfortable personal and social situations for those afflicted that depend on others to choose products in which color is a predominant factor, such as pieces of apparel and decoration.

A sample group of colorblind people questioned in a recent study found relevant the development of a system which would allow them to identify colors. The development of a graphic color identification system was the answer to this need, its concept and structure making it universal, easy to communicate and memorize.

This system can be applied to a variety of products and allow the colorblind to reduce or even eliminate their dependence on others.

1. INTRODUCTION TO THE COLORBLINDNESS PROBLEM

Colorblindness is the common denomination to a congenital alteration related to the incapability to distinguish several colors of the spectrum due to a visual deficiency (Figure 1).

This people have a normal vision relatively to the other characteristics which compose it, even though the deficiency hampers, or even makes it impossible for those afflicted to perform certain everyday social and professional tasks. Colorblindness affects approximately 350 million people - 10% of the world's population and it's a handicap usually of genetic origin associated to a flaw in the X chromosome. Because of this, 98% of colorblind people are male.

The first symptoms of colorblindness are detected at school age due to the difficulty in interpreting drawings, maps and identifying colored pencils. Later in life a colorblind person is prohibited of performing certain jobs, while some professions will bring added difficulties. Similarly, managing daily routine poses problems, as well as , for instance, buying and choosing wardrobe as well as using maps and signs to provide orientation. Even while accessing internet some texts can become illegible due to the use of certain colors. Some companies have started creating web pages which can be seen correctly and easily by all. This has been possible due to the rising awareness that colorblind people represent a high percentage of the world population.

2. OBJECTIVES AND METHODOLOGIES

Once the problem had been identified its extent and impact on the subjects was evaluated. On a first phase of the study a sample of color blind people was identified and presented with a questionnaire. Its purpose was to identify the main difficulties of the respondents concerning
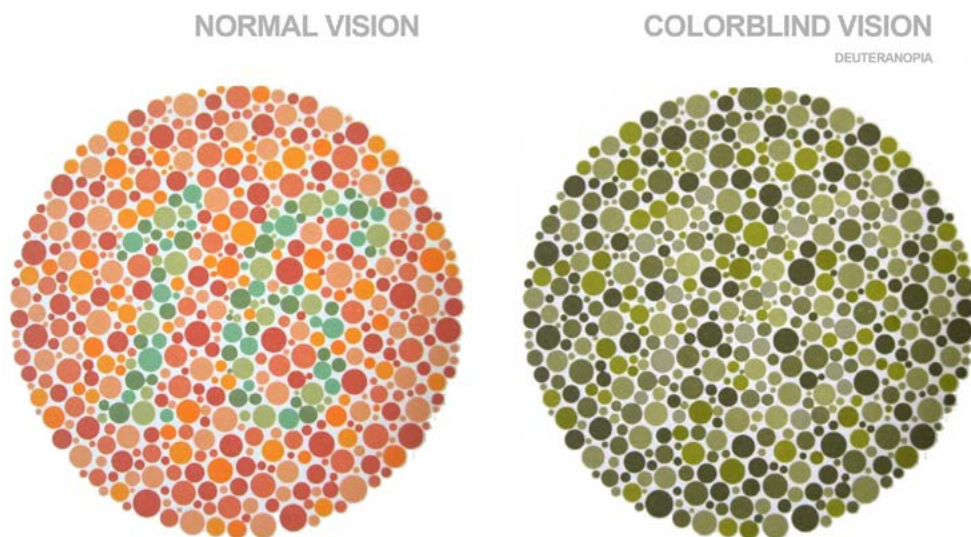

Figure 1 - Colorblind Vision

their color blindness and the processes and methods used by them to lessen and overcome these obstacles.

The collected information was treated and analyzed. Based on these results a conceptual basis was defined, capable of constituting a universal method of graphic color identification, easy to comprehend and memorize. ioning its volume, guiding the eyes in understanding it, suggesting its atmosphere.

3. MATERIALS AND METHODS

Using primary colors, represented through simple symbols, the system was constructed through a process of logical association and direct comprehension, allowing its rapid inclusion in the "visual vocabulary" of the user. This concept makes additive color a mental game, which lets the color blind relate the symbols amongst each other and with the colors they represent, without having to memorize them individually.

The system proposed is based on the search of the pigment color, using as basis the primary colors – blue (cyan), red (magenta) and yellow its additive secondary colors (Figure 2) and not the light color (RGB), because the color blind person does not possess the correct vision of the colors, nor a tangible knowledge of how their addition works.

Each primary color of the code is associated to three forms (Figure 3) which represent red, yellow and blue; from these three is the code developed.

Two additional forms were added representing black and white (Figure 3); in conjunction with the other elements they represent lighter or darker tons of the colors.

The secondary colors can be formed using the basic forms as if "mixing" the primary pigments themselves (Fig 4), making their perception and subsequently the composition of a color pallet
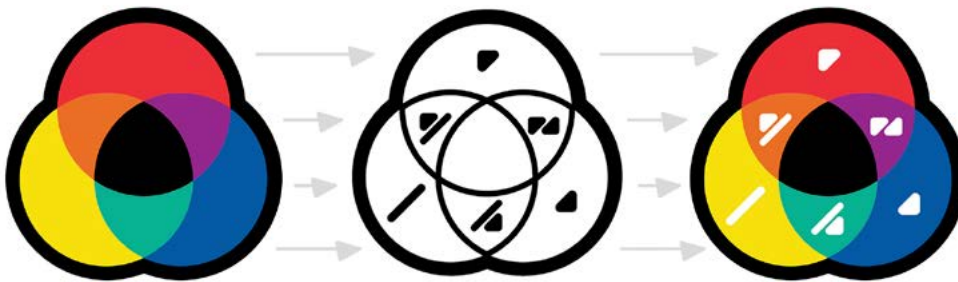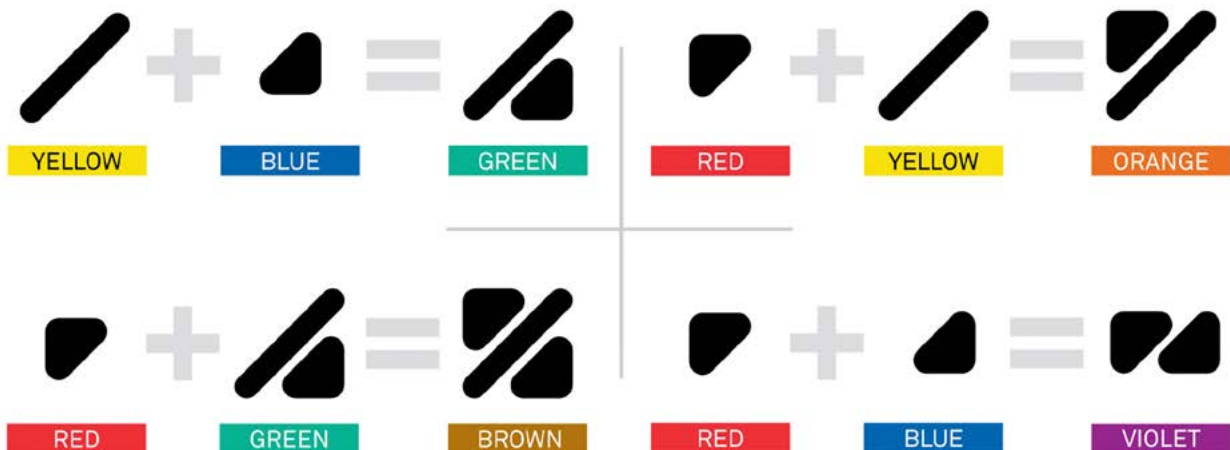

Figure 2 – Primary color addition – pigment colors

Figure 3 – Graphic symbols for 3 primary pigment-colors and white and black

Figure 4 – Graphic symbols – three primary colors and their addition

easy.

By associating the icons representing white and black to define darker and lighter tones to the three basic forms and their additions, a wide palette is constructed as observed in Figure 5. Conventional color designations were attributed to the additions and other combinations of colors, especially those used in apparel. Grey, was divided into two tones: light grey and dark grey (Figure 6). The importance of gold specific icon. Considering the logic of the codes' construction, these colors are represented by the combination of the golden-yellow and the element representing shine to define gold; light grey with the same element identifies silver (Figure 7).

The totality of the code, represented in Figure 8, covers a considerable number of colors and can be easily conveyed through information posted at the sales point, on web sites, or the product itself.

Figure 5 – Graphic representation of color addition with dark and light

Figure 6 – On the left Graphic symbols – tons of grey; Figure 7 – On the right Graphic symbols – gold and silvery
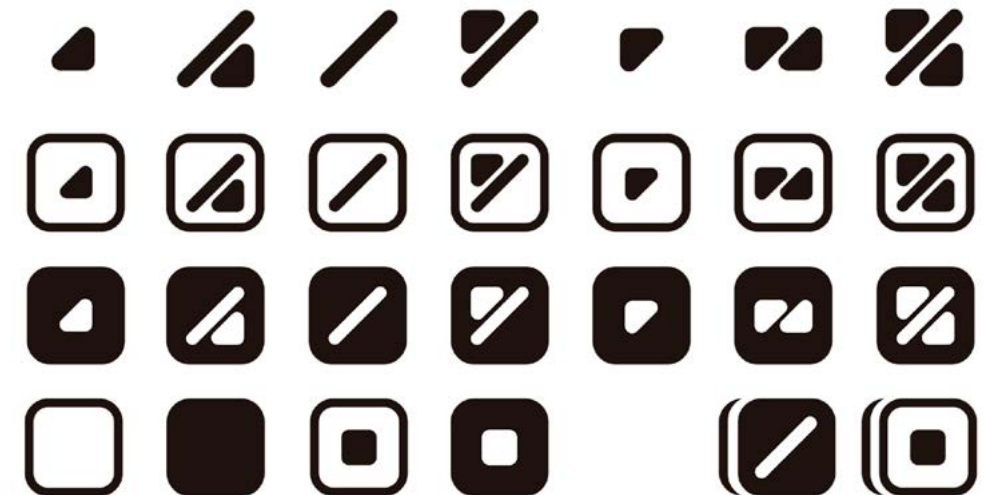
Figure 8 – Monochromatic graphic code

4. RESULTS

The application of the system is transversal to all the areas of the global society, regardless of their geographical localisation, culture, language, religion, as well as to all the socio-economical aspects.

School and stationery.

It is at school-age that usually appear the first and sometimes traumatic situations and difficulties caused by the wrong color identification.

The inclusion of the system in the school and stationery leads to inclusion (Figure 9), allowing the colorblind kid a perfect integration, with no doubts and shames.

Health and Services.

The selection of patients at Hospitals is made through color. At the ER, it is carried out an

Figure 9 – school material (real implementation)

Figure 10 – heath and hospitals (real implementation)

evaluation of the grade of "gravity" of a patient and a bracelet corresponding to a certain grade of priority is provided.

The inclusion of the system in hospital services and spaces where color is an element of identification and guidance makes orientation and easier task to colorblind.

In many places, color is the element of identification of the different services. A colorblind, resulting from its handicap, can not identify the color and its meaning. Also, many medicines have color as an identifying factor (Figure 10)

Transports.

The Metro system maps are a different context but equally valid on what concerns the use of the color identification code, in this case to individualize the different transit lines (Figure 11).
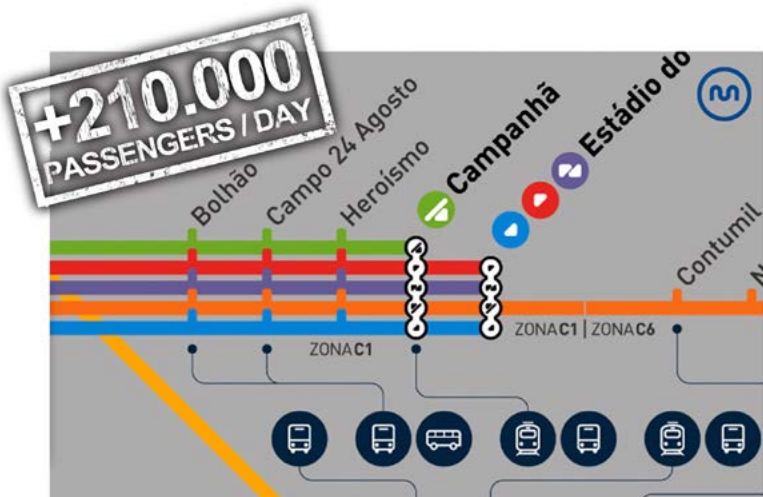

Figure 11 – Metro map Oporto (real implementation)

Figure 12 - Application clothing tags
(real implementation)

Figure 13 - Application clothing tags
(real implementation)

Clothing and textiles.

The developed code can be applied in multiple contexts in which color is important. One of the most relevant fields of application is in apparel and the color identification symbols can be applied to tags or integrated into the clothes themselves, similarly to maintenance and care information. The simple and stylized graphics and its monochromatic nature reduce the production cost of the labels in paper or cardboard, textile or stamp (Fig 12) and other implementation in cross-sector (Fig 13).

5. CONCLUSIONS

Each day society grows more individually centred. Each person, sometimes, becomes totally dependant on itself and asking for another person's help, besides creating some frustration and feelings of dependence, is not even always possible.

The "wrong" interpretation of colors can harbor insecurity in social integration of the individual whenever the projected personal "image" is a key factor in rendering judgment.

The color identification system, aimed at color blind, can be greatly beneficial to a group which represents such a significant percentage of the population. Its use, given the characteristics of the system, means a practically insignificant cost and its adoption by the industry and society can improve the satisfaction and wellbeing of a group of individuals whose particular vision characteristics deprive them of a fully independent and tranquil every day experience of choosing their clothes.

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