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Using cartoon colours in multimedia presentations

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Abstract

Recently the informatics engineer had to take over also the task of the graphic designer and has to decide on the colour design of the drawn picture. To give the engineer, who has no thorough education in the colour design field, some help how to colour the different parts of his or her design, we studied on one side the colorimetric principles that can help his/her work, and collected available graphic design colours from cartoons of different cultural regions. In this paper the complexion, sky and grass colours will be analysed and design suggestions provided.

1. Introduction

Traditionally when an art work was produced, an author provided the text information, a graphic designer produced the artwork and a graphic arts expert has set during the preprint process the coloration of the single elements of the design so that they should correspond in the final product (print, slide or movie) to the expectations of the author and the designer. Now very often the informatics engineer gets some sketches from the author, and his task is to produce both the graphic artwork, using some graphical program, and to select the coloration from the palette the graphic program provides. But these programs usually provide only a high variety of colours and give no guidance how the informatics expert should select from that variety the colours to be used to fill in the different surface elements, representing well know objects. Very often the outcome is then an image with clashing colorations.

See for example the picture in Figure 1. How should the designer select the colour of the objects in this design?

The coloured slides of the presentation of this paper to be seen at the WEB page of J. Schanda [1] show three possibilities. The inexperienced designer needs some guidance which of this to choose.

In the following we will show two possibilities to deal with this question and will conclude that only a good blend of the two methods can provide an adequate result. In the present paper we restrict our investigation on the three most important objects of a scene: complexion, sky and grass coloration.

Figure 1: A graphic art picture that has to be coloured.

2. Colour theory approach

If we look at a colour rendered graphic drawing, we will first realize the single patches of the design as falling into the category of one of the unique (or basic) hues: red, yellow, green, blue, or resembling one of the achromatic hues: white or black. For every hue we can tell that it comes most close to red, but it has some yellow or blue content, or it haws a yellow tint with some red or green content, etc., but a red can never have a green content or a yellow a blue content, and vice versa; these colours are antagonistic. Therefore we depict them on the hue circle circumferentially in opposite positions, see Figure 2, which shows the hue circle according to the NCS Colour System (see e.g. [1]). (For a coloured picture see http://www.knt.vein.hu/staff/schandaj/schandajpubl.htm)

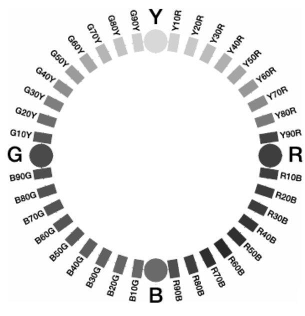

Figure 2: Hue circle with colour notation according to the NCS system of colour order.

There are several similar colour order systems, and practically for each of them colour harmony rules have been set up [2], [3]. So one can select two-, tree- four colour combinations that will show good in a picture. Naturally beside the hue, the lightness and the chroma of the colour have also to be chosen correctly. These have to be then in relation with the surface area one would like to colour with them. Stronger colours on smaller surface areas can keep balance with paler colours on larger surfaces [4].

A step further in colour theory leads us to the findings of Berlin and Kay, who determined that even in modern society one uses only eleven fundamental colour terms [5].

Beside of the four unique hues there are four intermediate or secondary hues where we use short colour notation: orange, purple, pink and brown. On the achromatic axis one distinguishes between white, grey and black. These terms and some modification words, such as strong, pale, light, dark, etc, can express all other colours.

For the eleven fundamental colours one can find samples for which most people use the given term, these are called focal colours. Table 1 shows the colour category, its Munsell notation and the corresponding CIELAB co-ordinates for the 11 focal colours [6].

Colour category	**Munsell notation**	**L***	**a***	**b***
white	Neutral 9.9/0	99.98	-.06	.07
grey	Neutral 6/0	61.70	-.04	.04
black	Neutral 0,5/0	8.99	.70	2.34
red	2,5R 4/14	41,22	61,4	17,92
orange	2.5YR 6/16	61.70	46.66	76.94
yellow	10YR 8/14	81.35	15.10	90.21
brown	10YR 3/6	30.77	9.51	37.16
green	2.5G 5/12	51.57	-63.28	28.96
blue	2.5BP 5/12	51.57	33.80	-39.96
purple	5P 3/10	30.77	36.90	-32.14
pink	5RP 7/10	71.60	40.04	-2.70

Table 1: Focal colours for the 11 basic hues

To get a better feeling of these colours we show the structure of the CIELAB colour space in Figure 3. Here you see the white-black axis, and perpendicularly to this some chromaticity planes at different lightness (naturally this is a very crude representation, the realizable hues at different lightness show varying chroma values. But in such a colour solid the focal colours can be visualized and the colour harmony settings realized.

If we see the coloured surface bound to an object, i.e. we see a coloured object in the picture then for well familiar objects we can show in such a colour solid the colour point that most closely resembles the object colour in our memory. These are the prototypical colours of the objects. It can be shown that for most surfaces the memory colour of the object shifts towards the focal chromaticity, and our memory usually exaggerates the colour, this means that in our memory the colours tend to be "cleaner" then in reality: either more saturated or whiter [7].

Fine graphic art designers learn courses that deal with all these subjects, plus they have numerous practice sessions where they learn to master these issues in practice. This is not given for the informatics engineer, therefore for him it is a better and easier way to learn from the artist, and to start from designs already available, and modify them according to his or her aesthetic feeling and knowledge.

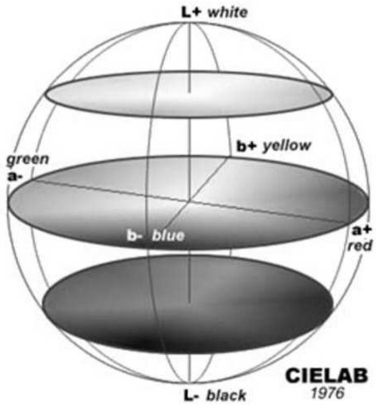

Figure 3: CIELAB colour space representation.

3. Learning from cartoons' designs

Multimedia presentation are often very similar to cartoons, therefore we studied coloration practices in cartoon design. Selecting cartoons, both hard copy-and soft-copy (WEB based cartoons) from all over the world, we measured the colour of typical objects displayed. In the present paper we restrict ourselves to three objects: complexion, sky and grass, and to European hard-copy cartoons as well as European and Japanese soft-copy cartoons. (For a demonstration of the different cultural backgrounds we have to refer the reader to the WEB page listed in
http://www.knt.vein.hu/staff/schandaj/schandajpubl.htm
there we show that even the same hard-copy image, if printed in France or Hungary can show differences, that in Europe more subtle coloration is used, that Japanese pictures are coloured more strongly, but the most harsh colours can be found in American cartoons.)

Colours of the hardcopies were measured with a small hand-held spectrocolorimeter, numbers shown refer to CIE Illuminant D65 and 2 degree observer. For the soft-copy presentations we took the sampler tool of Photoshop and supposed sRGB colour for the conversion.

3.1. Results

Table 2 shows L*, a*, b* values and their standard deviations for European hard-copy and European as well as Japanese soft-copy presentations measured on a large number of cartoon pictures. As can be seen the three groups are well apart from each other (colour samples representing the different depicted values are to be seen in the WEB version of the paper).

		European soft-copy			European hard-copy			Japanese soft-copy		
		L*	a*	b*	L*	a*	b*	L*	a*	b*
Complexion	Average	77	21	33	77	14	43	85	10	24
	St.dev.	8	11	12	1	4	8	7	7	9
Sky	Average	76	-10	-19	72	-17	-14	80	-8	-40
	St.dev.	9	5	11	7	6	9	13	4	11
Grass	Average	70	-21	36	73	-16	29	67	-30	51
	St.dev.	13	8	21	2	3	13	10	11	12

Table 2: Complexion, sky and grass colours in different cartoons

The same information is seen in graphical form in Figure 4, where the Japanese soft-copy results are in red, the European soft-copy data in green and the European hard-copy ellipses in blue. The corresponding L* values are written beside of the standard deviation ellipses.

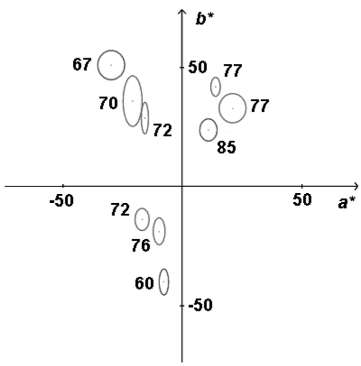

Figure 4: Chromaticity locations and standard deviation ellipses for the nine colour regions depicted in Table 2.

4. Analysis of the results

In Figure 5 we compared the average soft-copy, hard-copy and the so called prototypical (memory) colours of complexion, grass and sky (we show also hard- and soft-copy comparison for water, here we have no representative prototypical colour available). L* values are again written beside of the chromaticity points.

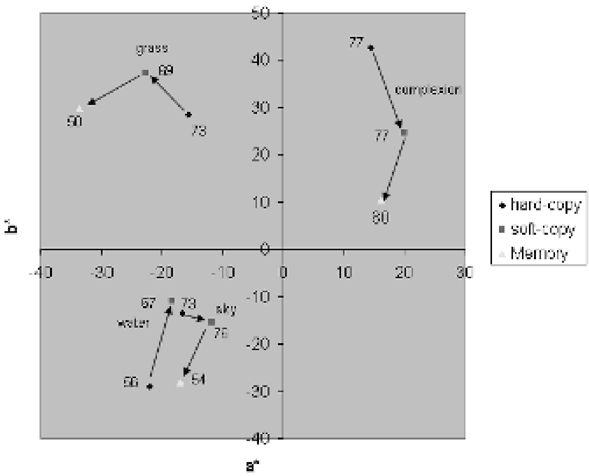

Figure 5: Hard-copy, soft-copy and memory colour comparison.

As can be seen, for grass and sky the memory chromaticity is more saturated then the chromaticity found in cartoons, while for complexion the memory chromaticity is paler then what the cartoon designers have produced.

5. Conclusions

From the above analysis we can conclude the following:

- The prototypical colours provide a good starting point for multimedia colour design.
- Multimedia designers have to consider for which population they produce their design. There are, for example, characteristic differences between the European and Japanese colorations (on the WEB we show the same picture according to average European and Japanese coloration).

To be able to make really appealing designs, further colour harmony rules have to be taken into consideration, thus as the load on informatics engineers increases to produce multimedia presentations, they have to get some introduction into the aesthetics of coloured design.

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