Color-blind painting experience methodology

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ABSTRACT

It is quite obvious color management is very difficult for color-blind people. Moreover, in the case of a color-blind artist the problem worsens, especially visual artists. Difficulties arise if the artist tries to express "real" colors using canvas-based traditional painting methods (eg. using acrylic colors to develop a full artistic experience and personal expression). For a traditional painter, color management is based exclusively in the ages-old color naming schema and the artist's own perception skills. For a daltonic painter the color names can be of some help, but visual perception cannot be relied upon. Modern color theory and computer graphics tools could help in multiple ways to guide color-blind artists in their artistic work. The proposal described is based on personal experience.

1. INTRODUCTION

Daltonism is a disability of vision that many people along history have not known they suffered and today, though easily diagnosed, does not cause any major problems in most activities (except jobs such as plane piloting, security, control quality, etc.). However, it is quite obvious that is a big handicap for any kind of artistic expression, mainly in painting, though it is well known that many historical painters were daltonics. Renowed ophtalmology researchers such as Philippe Lanthony, Michael Marmor [7], Barry Cole, Jonathan Nathan [3] among others have investigated the relationship of daltonism and painting. They quote artists such as **Constable** (1776-1837), **Turner** or the cubist **Fernand Leger** (1881-1955) [4] and many others (though their disability is not actually demonstrated). Additionally, more detailed studies about painters having visual disabilities like **Charles Meryon** (1821-1868) [11], **Jens Johannsen** [7] and many others [3] are introduced.

This paradox brings forth questions having complex answers: were those artists conscious of their problems? Did they paint what they saw? Did they invent the colors? What, if any, painting strategies did they use? Authors like Lanthony [4] have dealt with some of these questions though no practical solutions have been proposed yet.

On the other hand, the relationship between color theory and painting is also something to be reckoned with. Taking into account modern color theory, the color wheels like those proposed by **Moses Harris**, **Eugène Chevreul**, **Johannes Itten** and others appear as very important reference tools for the artistic practice. A color wheel is a map that sorts and classifies colors, that helps in finding new subtle color values, performing color mixes and establishing complementarity relationships has been found to be quite useful. Nowadays, many practical manuals can be found, mainly addressed to artists and art students that base their practices on the color wheels derived from color theory [6] [9] [10] [12].

Can color wheels help a daltonic artist? Such tools are doubtless important devices, specially in the applied arts, design, decorative painting and also play a significant role in non-figurative painting. However, it is quite clear that the fundamental problem for a daltonic painter that is inspired by the "visible" reality or would like to represent it, is found in perception. How does the painter establish a relationship between a given color in a landscape, object or model and a pigment? The problem is largely unsolvable by means of using the eye's capabilities only, given the basic disability suffered by a daltonic person.

It is a fact that the creative freedom brought by the *avantgardes* freed both art and the artist from any formal slavery or coloring norm and nowadays it can be safely stated that there does not exist a "rightful way of painting". A century ago the fauvists explained this quite clearly. Actually, challenges for a daltonic painter could just to look for the figurative representation of something unseen by him/her, exploring the visible reality in the eyes of most people and find guide elements in a space that causes confusion.

My personal experience goes in such a fashion. As a daltonic person (deuteronome) and artist I have suffered the confusion, the vertigo of disorientation in color space. My pictoric experiences brought me to inner frustation due to the fact that I could not "recognize and represent" not only what others see, but also the vast richness that I perceive in the surrounding world. Studying color theory has given me a knowledge of the myriad ways of color organization but it has not given me any insights regarding its perception. Clearly, a method of opening new avenues of orientation to achieve a more satisfactory artistic experience is dearly needed.

2. METHOD

The method needs to solve two problems in the first place:

1. Identifying the color in a given area of the model with some precision.
2. Precisely finding an equivalent pigment.

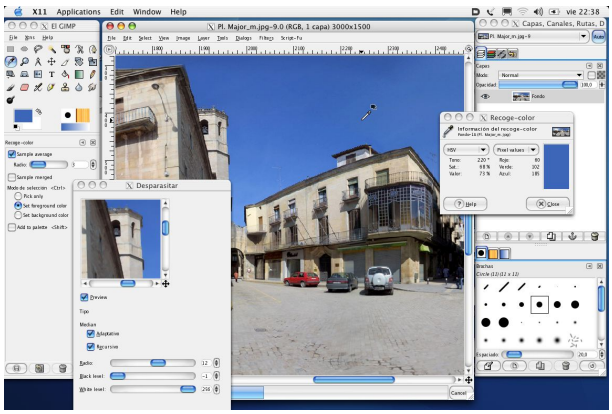

Figure 1: Color measure in Gimp

The first goal can be easily solved by applying color measuring techniques to the target image. Modern digital technology allows a photo or video camera to be connected to a computer to obtain a numeric representation of the target model. However, a bitmap image is composed of an enormous amount of pixels having a huge wide diversity of color values. This is also true even if only a small area of the image is examined. Taking this into account and from the point of view of the painting practice, to get useful information, the image needs to be simpler. To achieve this, a 'median' filter can be applied to the image and it has the effect of greatly simplifying color values while respecting the various image contour limits. To bring up more obviously the color subtleties, the saturation levels can also be increased. In this particular experience I have used a Canon 10D SLR digital camera and the software Gimp (GNU Image Manipulation Program).

Regarding the achievement of the second goal, identifying an equivalent pigment is found to be an insurmountable problem as the color tubes are only classified by a color sample and the so-called traditional name: Ultramarine Blue, Emerald Green and so forth, with noticeable differences between manufacturers. Fortunately, some modern paint providers not only control prime materials,

GOLDEN HEAVY BODY ACRYLICS

COLOR CODE AND NAME	HUE	VALUE	CHROMA	L*	a*	b*	H°	S %	B %	100% / +10W
1040 Carbon Black	Black	1.00	0.3	25.77	0.20	-0.17	0	0	18	
1090 CP Cadmium Red Light	9.0 R	5.25	15.9	51.78	57.62	42.74	2	80	79	
1020 Burnt Sienna	3.0 YR	3.25	4.0	33.67	16.86	12.58	10	49	35	
1070 CP Cadmium Orange	2.0 YR	6.25	17.5	63.85	53.5	63.6	17	91	96	
1030 Burnt Umber	9.0 YR	2.50	1.0	28.57	2.86	4.06	21	18	23	
1035 Burnt Umber Light	8.0 YR	3.00	1.6	30.12	6.41	8.95	23	34	26	
1110 CP Cadmium Yellow Dark	9.0 YR	7.75	16.5	78.08	26.94	85.98	36	100	100	
1130 CP Cadmium Yellow Medium	3.0 Y	8.00	16.1	83.91	15.55	94.35	43	100	100	
1120 CP Cadmium Yellow Light	8.5 Y	8.75	16.0	88.89	-1.72	94.38	52	100	98	
1135 CP Cadmium Yellow Primrose	10.0 Y	9.00	16.0	91.06	-8.78	85.05	56	100	95	
1060 Chromium Oxide Green	9.0 GY	4.00	4.6	44.19	-15.50	16.04	100	37	36	
1143 Cobalt Titanate Green	1.5 G	5.75	8.0	59.96	-34.23	24.54	120	47	57	
1142 Cobalt Green	10 G	3.00	5.5	35.93	-19.00	2.64	156	47	30	
1051 Cerulean Blue Deep	1.2 PB	3.00	7.9	38.25	-16.56	-23.26	198	85	42	
1050 Cerulean Blue Chromium	1.0 PB	4.00	7.6	42.76	-12.04	-32.29	206	81	54	
1140 Cobalt Blue	6 PB	3.00	11.0	36.63	9.51	-46.66	227	72	58	
1005 Anthraquinone Blue	7.5 PB	1.25	3.3	24.44	5.02	-6.00	272	20	20	
1010 Bone Black	Black	1.00	0.5	24.58	-0.03	-0.46	300	1	18	
1080 CP Cadmium Red Dark	6.0 R	4.00	14.0	38.20	42.27	19.41	354	72	51	
1100 CP Cadmium Red Medium	7.0 R	4.25	16.0	42.85	50.10	27.70	356	77	62	

Figure 2: Partial table of Munsell equivalences, L*a*b*, HSV of acrylic Golden colors.

they also normalize and organize their color material following a standard norm. To develop this experience I used acrylic colors from 'Golden Artist Colors' because they are high quality and

provide precise numerical data about each color. (Other colors could be used, just the numeric values of each color need to be known or measured).

For example, the classic color 'Ultramarine Blue' is tagged by Golden as having 'Hue: 8.0 PB, Value: 2.0, Chroma: 4.5' (in Munsell Notation List) and 'L*24.36 a*12.28 b*-25.74' (in CIE L*a*b* Values). Using this information it is easy to build an equivalence table with HSV values (Figure 2) and a color wheel (Figure 3), where each acrylic color is placed in its Hue equivalence (between 0° and 360°). A more accurate classification would allow us to define a three dimensional model (like in HSL) where brightness and saturation would be well differentiated. Being practical, a disposition in a circular palette (Figure 4) allows for comfortable usage in the practice of painting.

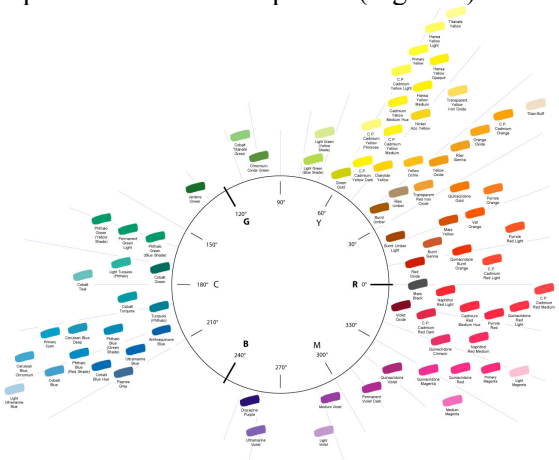

Figure 3: Golden color layout in a circle

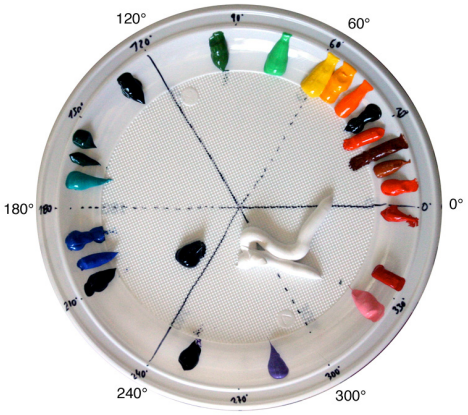

Figure 4: Color layout in a palette

This way, the specific color in a given area of the target model is known and the palette is well defined. At this point, what we call an artistic experience can begin, a spontaneous and intuitive relationship between the target model and its representation, where the canvas and the colors come alive, where the brush strokes expressions and expressive freedom reflect the inner life and sensitivity of the artist.

3. RESULTS

The simplicity of the described method allows for easy applicability in helping to recognize and apply colors. However, it is really difficult to gauge and evaluate the results and artistic experience, as they are obviously of subjective nature.

Results can thus be presented to observers for them to subjectively evaluate and criticize. Personally, I might add that this experience has been of great help and has provided me with a valuable resource for being at ease with artistic practice. Some results are shown below though the paintings would be best appreciated *in situ*. (Figures 5-8).

Figure 5: *Plaça Major de Tàrrega*, acrylic on canvas (fragment), 195x114 cm. by the author.

Figure 6: *Woman looking through a window*. Acrylic on canvas, 116 x 90 cm by the author.

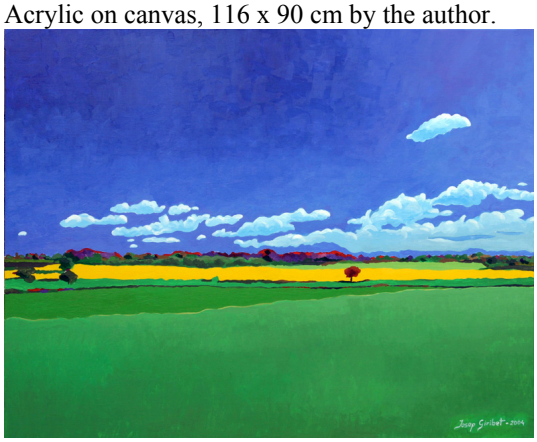

Figure 7: *Paissatge de la Segarra*, acrylic on canvas, 116x90 cm. by the author.

Figure 8: *Maria*, acrylic on canvas, 89x116 cm. by the author.

4. CONCLUSIONS

The means employed as well as the process described provides low precision, with certainly variable results depending on the specific models and systems used, camera specifications, non-controlled lighting, specific software and overall non-standarized process leave some margin for improvement. However, the use of the techniques in a largely intuitive field such as artistic pictoric practice by persons having some sort of visual color disability, allow for a method that could be called 'color perception prothesis' that without any doubt can help such persons greatly. It can also be argued that this methodology can be extended to be applied in two distinct ways: not only in helping color-blind people find their own artistic expression but in Art education with a broad scope.

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