

The Creation of a Virtual Colour Course

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Abstract, I am presenting an extended project that began with the creation of a virtual paint-colour palette that has been used to translate a studio based colour course for the computer. The aim was to combine knowledge of paint mixing and colour interaction with the speed and flexibility of computer tools and platforms to augment the practical education of art and design students. The resulting program supports informed and independent learning and also explores the relationship between analogue and digital colour.

1. Introduction

The first stage was a shared research project with Dr F.Carabott, to investigate the computer as a means to explore colour ideas for pigment dyeing, printing and painting; processes used in Textile design and in my own creative practice. We found predicting paint colour mixtures on the computer was impossible and the difference between material and virtual colour was an unforeseen obstacle to our initial ideas, before becoming the main subject of our study¹. Subsequent research demonstrated the relation of analogue and digital colour, and led us to a method for reconfiguring the computer colour system to simulate pigment mixtures.

In 2001 we published *Chromafile*, a 'paint' colour palette that works in Photoshop and other imaging systems.

2. A Method For Simulating Paint Colours On The Computer Monitor

When warm yellow and cobalt blue are combined as pigments their mid-colour is a green, while on the computer monitor the mid-colour of a gradient between the same colour pair is grey (Fig.1).

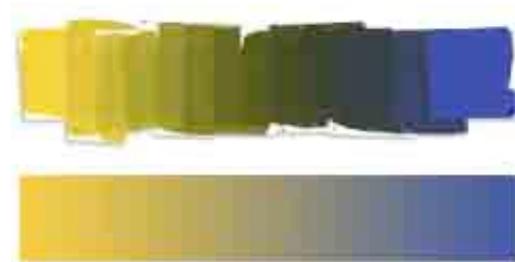


Fig.1

Our first practical step was to compare RGB straight-line colour gradients created with Photoshop's Gradient tool to stepped, mixtures between pigment colours.

Colour for computer programs is organised around a conventional colour space, similar in dimensions to the Munsell Colour Solid. Photoshop utilises the **Lab** colour space whereby any colour can be located by reference to three co-ordinates: L, a and b. Across a horizontal plane are yellow to blue (+b to -b) and the other opposing 'primary' colours magenta (red) to green (+a to -a). A third, perpendicular axis (L) represents the value range from 0 (black) to 100 (white).

We mixed gouache paint colour scales between eleven hues plus black and white and using a Spectrophotometer (X-Rite Colortron 11), were able to plot their **Lab** positions.

The paint colour pathways were mainly curved, each one distinct to the particular set of parent colours (Fig.2).

¹ Dt Ferdy Carabott is a photographer and computer imager, I am a painter and had no computer experience.



Fig.2

Taking a middle slice through **Lab** space produces an approximate colour circle, where we can compare the straight-line gradient for yellow to blue with the paint mixture pathway, which curves into green territory (Fig.3).

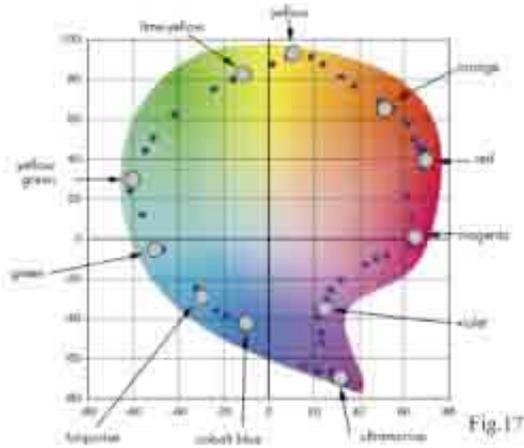


Fig.3

We devised a method to produce a 'paint' colour gradient²; this was achieved by applying a green 'colour correction' gradient to the Photoshop yellow-blue straight-line gradient, to make it follow the paint mixture with respect to Hue and Value (Fig.4).

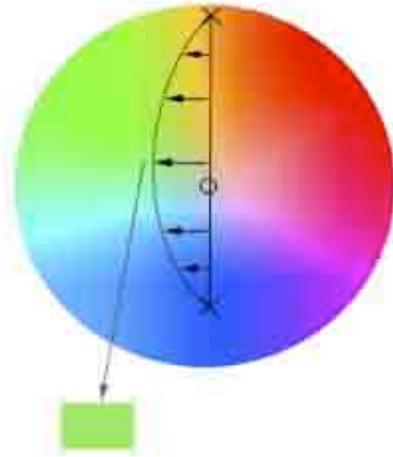


Fig.4

A characteristic of paint is that a mixture between complimentary or opposing colours (red-green, orange-blue, yellow-purple) produces a mid-colour that is darker than the two parent colours; for computer gradients there is no deviation so an adjustment to the L value of the correction gradient is made (Fig.5, Orange to Ultramarine Blue shows a strong difference for Hue and Value).



Fig.5

Mixing Black or White with various Hues produces a change of colour as well as the intended Value change. White paint mixed with Magenta produces mid values that are slightly blue (ish), yellow and black mixtures are slightly green (ish), these factors were built into our paint colour gradient profiles.

Eventually we created fifteen step gradients for eleven Hues plus Black and White, to produce a total palette of over 1000 colours. We added a gradient tool that could generate new colours from what we called the Chromafile palette. While the gradient tool generates RGB straight gradients it is still possible to produce new colours that are close to the paint mixture by applying paint colour rules (colour mixing logic). Straight-line gradients can be navigated by steps through **Lab** colour space to follow the curved pathway of the paint mixtures.

² F.Carabott & G.Lewis, *A Method for Simulating Paint Colour Mixtures on the Computer Monitor*. AIC Color 01, Conference Proceedings, Rochester, NY, USA.

3. A Virtual Colour Course

In 2002 I began working with Hao Dam, a multi-media designer, on a University sponsored project to produce a computer version of the studio colour course I had been teaching on the Textile Design Course at Central St Martins³. A significant incentive for devising the program was the ever-increasing class sizes and the limited individual student contact afforded; however the computer format added extra dimensions to the understanding, use and direction of the colour course.

The paint-colour palette enabled a relationship to be developed between the computer's onscreen imaging tools and the techniques and practices from the history of material colour. The colour program connects established language and knowledge from the use of pigments and coloured material with easy to use computer tools in a range of freshly designed colour formats, that are based on established instruments for exploring and studying colour relationships. The studio problems are carried out with painted swatches and printed papers that are typically flat and opaque.

The first stage was to combine the Chromafile palette with the gradient tool as a combined colour mixer; over 1000 simulated paint-colours can be sampled directly and other mixtures are produced in two open gradient channels (Fig.6).

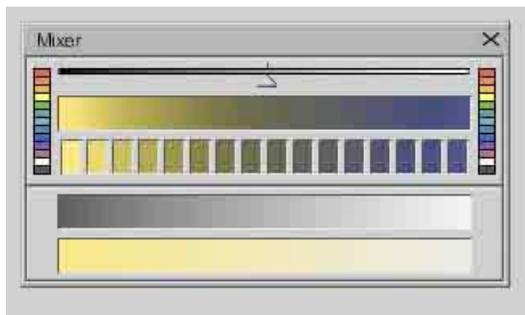


Fig.6

The mixer allows an unlimited number of colour 'mixtures' to be produced which are then used with twelve separate platforms, each dedicated to a specific colour problem. These include Simultaneous Contrast, Perceptual Transparency, Colour Extension, Colour Charts, Colour Composition and Typography (Fig.7).

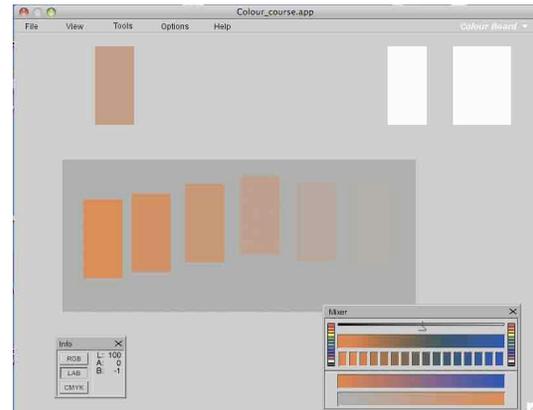


Fig.7

The program was created in (Macromedia) Director; it is comprehensive and fully interactive, providing a convincing representation of the studio colour experience. The tools can also be used independently, the scope of the creative and research options is not yet fully determined.

The platforms do not provide automatic, pre-determined colour solutions, in the same way the studio colour course does not specify 'rules to use colour correctly'. The colour mixing tools and variable screen formats are designed to explore colour principles and colour behaviour but each individual user can generate their own colour solutions, research and design.

The course is structured as a series of separate platforms that focus on either a particular colour idea or support a range of outcomes. Colour problems and exercises move from simple to complex in a sequence of ideas that build one on another to complete the Colour Course. Tutorial notes and 'how to' instructions are separate and do not occupy working screen space; the screen is kept relatively clear of information and tools to create a neutral environment for the colour experience (Fig.8).

³ G. Lewis, 1996. Colour Theory for Textile Design Students, in Aspects of Colour, Ed.H.Arnkil & E.Hamalainen, UIAH, Helsinki.

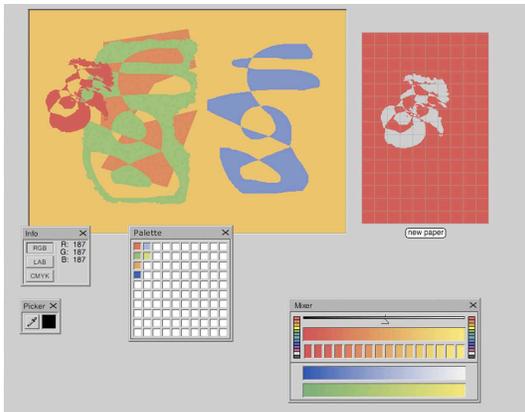


Fig.8

Two additional files ‘About Colour’ and ‘About Chromafile’ illustrate paint colour terminology and demonstrate the relationship of analogue and digital colour. The illustrated texts support on-screen work and provide high quality, printed reference for studio teaching. The facility is there for the user to illustrate their own colour ideas and educational materials by for example importing their colour examples into Word documents (Fig.9).

Tutorial: Colour Collage

"Remember that a picture- before being a war horse, a nude woman or a story- is essentially a flat surface covered with colours, arranged in a particular order."
Maurice Denis 1880

Colour Collage; enables colour relationships to be explored with simple cut and place, collage-tools, and an open compositional-format. The format can reproduce all the previous colour course ideas, with the additional aspect of colour composition.

The format is a "before being" anything else means for exploring colour, using single-colour shapes that can vary between opaque and transparent, with straight or irregular edges.

The illustrations present established colour ideas and either specified or improvised colour schemes that involve exploring the dimensions of colour and colour mixing.



Colour Study using Opaque, Cut and Tear Options



Fig.9

The program can be used with other colour course texts (Albers, Itten etc.) and offers a practical accompaniment to the ever-expanding field of colour research and publishing. Different, alternative and sometimes-competing theories of colour can be explored with tools and formats that are open to a variety of uses. An example is to use the Colour Circle format and Colour Mixer to compare Johannes Itten’s Colour Circle (three primary colours) with the Natural Color System Hue Circle (four primary colours).

4. Conclusion

The completed Colour Course is a stand-alone education program that can be used in any location, by any student or colour practitioner; it is a particularly useful lecture tool. I believe the program provides significant benefits for art and design education, by providing practical support and knowledge for independent and flexible study. The program supports sustainability by relating virtual with analogue colour to encourage rehearsals and experiments on the computer leading to less waste with actual materials; the palette and colour studies also support digital print production.

In 2009 I published a book 2000 Colour Combinations using the Chromafile palette to generate a large quantity of pure paint-colour samples and subtle colour mixtures that are printed to a high quality in a relatively cheap format. The paint-colour gamut of my palette made the printed [material] outcome, problem free for proofing and printing⁴.

The whole program, including platforms and tutorial files was completed in 2013, and published as the Virtual Colour Course.

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Dr Ferdy Carabott, Chromafile, London, UK.

Hao Dam, Virtual Colour Course 2003-2009

Steve Capon Virtual Colour Course 2012-13

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