Color is Communication.

Randolph S. Irvine, Portrait Displays, Inc.

Medium as Message.

In 1964 Marshall McLuhan published "Understanding Media: The Extensions of Man". In it he claimed content was affected as much by the medium or method of conveyance as by the content itself. In this school of thought, a medium such as a display or television affects the content an audience perceives by appealing to the sense (of vision) through which the message is conveyed. Because displays directly convey a detailed image, the audience isn't required to engage with the content in an effort to fill in details to understand what the content creator was intending to portray. Unlike the spoken word or printed literature, picture-based displays come close to replicating the imagery of the human mind.

If the medium of the content defines its effectiveness at communicating with its audience, only the quality and accuracy of that medium could affect its perception. For centuries humans have perfected drawing, painting, and creating images to best reflect reality based on our perception. In all that time, the degree of work and expense required to reproduce an image dictated its general adoption. Today, electronic displays allow for the fast, low-cost production of content making communication ever more efficient. The technology of these displays has evolved making them ever more effective. The last barrier in the quality of picture-based content for the accuracy of communication is color.

What is color?

Color can be defined scientifically, mathematically, artistically, or by using any number of methods according to the context of the discussion. For the purpose of this discussion of electronic displays, color is a numerical designation representing hues or shades of primary colors used in combination to represent a subset of the visible spectrum. Although scientific descriptions can and do exceed this definition in different contexts, for the purposes of this discussion this subset is called a color space.

What is a color space?

An abstract numerical model of color would be arbitrary without a reference. Numerous internationally-recognized color spaces exist so color reproduction, regardless of medium, is commonly understood and consistent. Mathematically, if white is considered the absence of all color, and the black presence of all color, the full spectrum of possible colors within the perception of the human eye can be plotted with white as a center point and the saturation of all other colors radiating outwards.

The necessity of numerically defining a color space has contributed to the general consistency of experience in media. The production of printed materials, textiles, paints, and all manner of industrial applications can predictably select colors for reproduction based on a reference color space. Even so, numerical color-space referencing is not a perfect representation of natural color. While math can express light and color in a commonly understood manner, light and color do not conveniently conform to linear expressions necessary to make mathematics logical. Because different color reproduction technologies require application-specific models to adapt to the intended medium, conversions between models is necessary. These conversions, although mathematically correct and logically applied, create errors in perceptions.

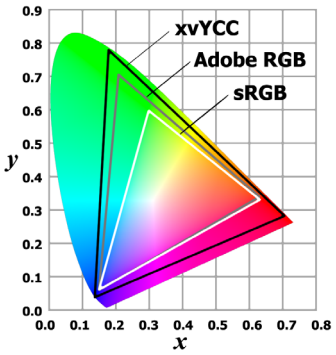

Figure 1. Color space examples.

For example, a color printed on paper will be affected by the light it is viewed under, the type of paper, the printing technology, and other variables. Within its own medium, paper printing color errors can be calibrated and made tolerable depending on the audience. However, when the necessity of converting color as perceived on electronic displays is added to the process

of printed materials, the inherent errors multiply. The seemingly simple concept of accurate visual perception, capture, and reproduction of any object or event is compromised by the adaptation and/or limitations of technology at each stage of the process.

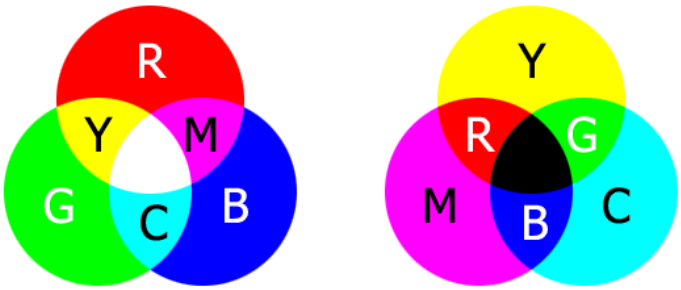

Figure 2. Emissive display (additive) vs. printed (subtractive) color reproduction process.

What are Chroma Tune™ and Photo Tune™?

For any color-critical process, there must be reference color spaces. Any display device within a color-critical process must have a known color space characterizing its color volume output. For effective communication using color on a display device, the color space should be a widely known standard. If not, the content's color will be changed to the characteristics of the display device rather than maintaining the color characterization of the content, thereby changing the intent of its message. Portrait Display's Chroma Tune and Photo Tune products allow display devices to be instantly recalibrated to a known color space without need for the user to know how or why. Content viewed on a Chroma Tune- or Photo Tune-enabled device allow content creators to accurately assure the media communicates the intended message.

Randolph Irvine is a former Congressional Aide to the US House of Representatives advising on science and technology. He currently is Portrait Displays' Director of Product Marketing researching and developing leading edge technology for displays.