Colour Gamut

The colour gamut describes range of colour within the spectrum of colours that are identifiable by the human eye (visible colour spectrum). The technology for modern day products to reproduce colours varies from device to device, with digital cameras, scanners, monitors, printers, tablets, projectors etc. all reproducing a different range of colour. In order to standardise this colour difference, various methods of measuring colour range have been used to create communicable ranges of colour so the capabilities of each device are understood. In 1931 the CIE (International Commission on Illumination) established a standard observer, with the commission recommending the use of chromatic coordinate’s xyz (CIEXYZ).

These coordinates are used to form the current standard diagram that sets the range or colour of human sight using mathematical theory. This chromaticity diagram is designed so the Y parameter is a measure of brightness of a colour, while the chromaticity of a colour is identified by the x and y parameter (Yxy). For instance, white has the same chromaticity of grey, meaning that their (x,y) value is the same on the diagram but their Y value is different because the brightness differs. The colour hue is represented by the outer points, with a movement from central white towards 100% saturation, meaning pure colour hue, represented by numeric values on the picture above.

Coverage and Area

In describing these colour standards, various terms are presented when talking about coverage and area. The colour area is the actual space on the CIEXYZ colour system which is diagramed, using the spectrum of human sight as the parameter and colour standard. Coverage, has to do with the actual ability of monitors, printers etc. to reproduce the colour areas of the various standards, and to communicate this ability as quantifiable colour data (sRGB, AdobeRGB, NTSC). These two terms help define the ability and range at which a product can reproduce the colour gamut in each given standard, which is more communicable than using mathematical statistics and colour theory. Using words like area ratio can be dangerous because the ratio can be misleading when talking about area coverage. If a product claims 100% area ratio for sRGB for instance, it’s impossible to calculate the difference in colour coverage for sRGB. That’s why colour coverage used, as a more straightforward descriptor of the monitor’s colour capabilities.
sRGB
sRGB is the most standard used colour gamut in digital products, Windows environments and monitors. The advantage of this colour gamut is there are reduced discrepancies in colour between input and output based on the narrow range. These limitations allowed for fast replication of colour and are why it was adopted as the early standard in digital products and displays. Over time, technology has improved and the use of this narrow scope is being replaced by the standard of Adobe RGB.

Adobe RGB
Adobe RGB was developed to expand the current offering and standards made by the IEC, to provide a broader colour gamut and offer a more realistic representation of visible colours in the display, photo capture and print spaces. This colour range offers a wider colour gamut than sRGB, but does not completely overlap with NTSC, with slight differences in reds and blues. With advances in technology and the desire to produce more vivid colour detail, has led to the increased use of this standard. It is also the standard for professional colour imaging environments and in the print and publishing industries with growing number of LCD monitors having the ability to reproduce most of this colour gamut.

NTSC
The colour gamut of the National Television Standards Committee (NTSC) covers a wide gamut, similar to Adobe RGB. The red and blue values vary slightly, with this range being developed for standard for television, being covered by 72% of the sRGB colour gamut. Monitors at a professional level for video editing must be able to reproduce this colour gamut but the average user mostly deals with applications that involve still images.

EBU
The EBU (European Broadcasting Union) has developed its own colour gamut that is based on Y’CbCr and is slightly different than NTSC and SECAM (France). The current EBU High Definition (HD) colour gamut is very similar to Rec. 709 with values of red and blue being the same and a difference in the green value. These colour spaces are all actually very similar with each region of the world having its own preference and way to solve challenges with each colour space and technological limitations in effectively replicating a wide colour gamut. With the edition of HD, wider colour gamuts will be utilised, especially with 4K Ultra High Definition becoming a more supported platform. These offerings will bring never before seen colour clarity to viewers, which was traditionally only focused on by photography, graphic designers and video editors.