COLOR MODELS

A color model is an orderly system for creating a whole range of colors from a small set of primary colors. There are two types of color models, those that are subtractive and those that are additive. Additive color models use light to display color while subtractive models use printing inks. Colors perceived in additive models are the result of transmitted light. Colors perceived in subtractive models are the result of reflected light.

THE TWO MOST COMMON COLOR MODELS

There are several established color models used in computer graphics, but the two most common are the RGB model (Red-Green-Blue) for computer display and the CMYK model (Cyan-Magenta-Yellow-black) for printing.

Notice the centers of the two color charts. In the RGB model, the convergence of the three primary additive colors produces white. In the CMYK model, the convergence of the three primary subtractive colors produces black.

In the RGB model notice that the overlapping of additive colors (red, green and blue) results in subtractive colors (cyan, magenta and yellow). In the CMYK model notice that the overlapping of subtractive colors (cyan, magenta and yellow) results in additive colors (red, green and blue).

Also notice that the colors in the RGB model are much brighter than the colors in the CMYK model. It is possible to attain a much larger percentage of the visible spectrum with the RGB model. That is because the RGB model uses transmitted light while the CMYK model uses reflected light. The muted appearance of the CMYK model demonstrates the limitation of printing inks and the nature of reflected light. The colors in this chart appear muted because they are displayed within their printable gamut (see below).

RGB COLOR

The RGB model forms its gamut from the primary additive colors of red, green and blue. When red, green and blue light is combined it forms white. Computers generally display RGB using 24-bit color. In the 24-bit RGB color model
there are 256 variations for each of the additive colors of red, green and blue. Therefore there are 16,777,216 possible colors (256 reds x 256 greens x 256 blues) in the 24-bit RGB color model.

In the RGB color model, colors are represented by varying intensities of red, green and blue light. The intensity of each of the red, green and blue components are represented on a scale from 0 to 255 with 0 being the least intensity (no light emitted) to 255 (maximum intensity). For example in the above RGB chart the magenta color would be R=255 G=0 B=255. Black would be R=0 G=0 B=0 (a total absence of light).

CMYK OR "PROCESS COLOR"

The CMYK printing method is also known as "four-color process" or simply "process" color. All of the colors in the printable portion of the color spectrum can be achieved by overlapping "tints" of cyan, magenta, yellow and black inks. A tint is a screen of tiny dots appearing as a percentage of a solid color. When various tints of the four colors are printed in overlapping patterns it gives the illusion of continuous tones - like a photograph:

The CMYK model forms its gamut from the primary subtractive colors of cyan, magenta and yellow. When cyan, magenta and yellow inks are combined it forms black - in theory. However, because of the impurities in ink, when cyan, magenta and yellow inks are combined it produces a muddy brown color. Black ink is added to this system to compensate for these impurities.

In the CMYK color model, colors are represented as percentages of cyan, magenta, yellow and black. For example in the above CMYK chart the red color is composed of 14% cyan, 100% magenta, 99% yellow and 3% black. White would be 0% cyan, 0% magenta, 0% yellow and 0% black (a total absence of ink on white paper).

SUMMARY

- RGB Color
  - Additive
- CMYK
  - Subtractive

BIBLIOGRAPHY