

Color Theory

Color Technology

A computer displays Cathode ray tube (CRT) uses the additive primary colors of red, green and blue (RGB). They are called additives because adding equal amounts of red, green and blue together produces a white display. Adding equal but lesser amounts of each produces various shades of gray.

CRTs display color by emitting light. A CRT emits light by striking phosphors with a beam of electrons. The three phosphors used in color displays emit red, green, and blue light.

Within the color spectrum there are several ways in which primary colors are defined; among these are additive, subtractive and pigment primary additive colors - red, green and blue - when combined in full intensities create white. These are the colors used in all RGB color monitors. Primary subtractive colors - yellow, magenta, and cyan when combined in full intensities create black. These are usually used in inks to print colors. Pigmented colors are variations and combinations of additive and subtractive primary colors.

Additive and subtractive colors are closely related. Pairs of additive primary colors can be combined to yields the subtractive primary colors, and pairs of subtractive primary colors can be combined to yield additive primary colors as follows

ADDITIVE

- red-green (yellow)
- red-blue (magenta)
- green-blue (cyan)
- red-green-blue (white)

SUBTRACTIVE

- yellow-magenta (red)
- magenta-cyan (blue)
 - cyan-yellow (green)
- yellow-magenta-cyan (black)

Color Mixing

For the purposes of color mixing, color is considered to be made up of four components:

- Hue
- Saturation
- Lightness
- Brightness

Hue is the most basic component of color. It answers the question, "What color is it?" Green, blue and red are examples of hues. Saturation is the next major component which determines color. It answers the question, "How colored is it?" Pink and red, and all of the possible variations (shades) are the same hue, but pink is said to be Less saturated than red. Lightness refers to how light or dark a color seems. This is a function of how much white or black is in a given Color brightness is closely related to lightness. This is a function of intensity and has to do with how light or dark an object appears. This is a function of how much light is illuminating an object.

How Computers Represent Color

Color-capable computers, such the modular Macintosh line, produce colors by identifying a bit or group of bits within memory to deal with each pixel on the screen. Depending on the number of bits available to control each pixel, a computer may be capable of as few as 2 colors (black and white) up to many millions. In multi-pixel depths, the color combinations are computed by the number of possible combinations available. The greater the number of binary digit s available, The greater the possible combinations.

In a 2 -bit pixel depth, you have these 4 possibilities

0	1	2	3
00	01	10	11

A 2-bit pixel depth,, therefore, has these 4 combinations

0	1	2	3	4	5	6	7
0000	0001	0010	0011	0100	0101	0110	0111
8	9	10	11	12	13	14	15
1000	1001	1010	1011	1100	1101	1110	1111

A 4-bit pixel depth,, therefore, has these 16 combinations