

Web-safe Colors

Effective visual design occurs when every element of art – a graphic, illustration, photograph and or text – work together in concert and form a hierarchical relationship to its visual neighbors, by it self and as a whole. Every color and visual element form a series of relationships that build to a greater whole” (Weinman, 1997)

The purpose of this paper is to provide a brief overview on how and why to use web-safe colors.

It is very common for new web designers to get surprised when, after creating a web page in a Mac and opening it in a PC, it will be displayed a little or sometimes completely different than what was idealized. A similar phenomena occurs when developing in PC. When developing a web page it is hard to be sure that the user will see the images and colors how the designer intended. This occurs because each platform has its own color palette. Fortunately, there are methods developed by web designers that help avoid these problems.

First, it is important to realize that colors change depending on the platform utilized. This happens because each of them has it own set of color to display the images.

Netscape and Explorer are the most popular browsers (browser is a software program that allows viewing of web pages). As Weinman (1997) explains, *“they share the same palette-management process. They work with the system palettes of each respective platform: Mac and Win95. This means that any artwork you create will be forced into a variety of different palettes; depending on which operating system it is viewed from”*.

Computer monitors display colors by mixing various intensities of three colors of light:
Red Green Blue

Lisa Lopuck (1996) defines well color bit-depth. *“For each color, red blue and green, your computer may be able to display up to 256 possible intensity values, depending on how many bits it uses to define each level of red, green, and blue (a bit is the smallest unit of data a computer manages – each bit is the same thing as a one or zero). When your computer defines red, green and blue in terms of 256 levels each, it’s using 8 bits of data for each channel. And, with each three channels using 8 bits of data, you’ve got a*

total of 24 bits of data ($3 \times 8 = 24$), hence the term 24-bit color.” Mathematically this amount of colors: 256 red x 256 green x 256 blue = 16,777,216 colors.

Vaughan (1998) explains what are Palettes: they “are mathematical tables that define the color of a pixel displayed on the screen. On the Macintosh, these tables are called Color Lookup Tables (CLUTs). In Windows, the term palette is used”. The chart below shows how many colors is available depending on its color depth:

Color Depth	Colors Available
32 – bit	16.7 + million colors and an 8 – bit (256-level) grayscale mask
24 – bit	16.7 + million colors
16 – bit	65.5 thousand colors
15 – bit	32.8 thousand colors
8 – bit	256 colors
7 – bit	128 colors
6 – bit	64 colors
5 – bit	32 colors
4 – bit	16 colors
3 – bit	8 colors
2 – bit	4 colors
1 - bit	2 colors

Lynda Weinman - Coloring web graphics.2 – page 10.

It is important for developers to keep in mind when developing web pages and creating graphics that they probably have 32 or 24-bit monitors, but the main audience might not have high bit monitors. In fact, most end users will have a less expansive computer with, at most, an 8-bit (256 colors) or 16-bit (65.5 thousand colors) monitors.

256 colors is the default set for Macintosh and Windows platform. They call this default the system palette. However, Mac and Windows reserve 40 colors to be displayed just on their system. This means from the basic 256 web colors just 216 will be viewed in both platform without any difference. The 216 colors are referred as **Web-safe colors**. The other 40 non web-safe colors will be displayed differently because each browser will dither (see below) the colors to ones on their system palette.

Vaughan (1998) defines Dithering as “a process whereby the color value of each pixel is changed to the closest matching color value in the target palette, using a mathematical

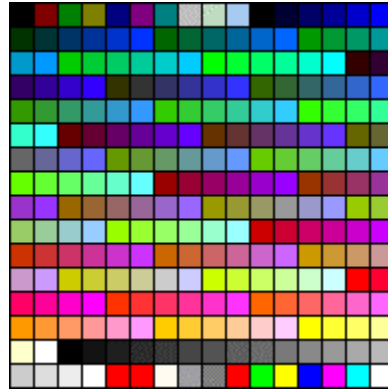
algorithm. Often the adjacent pixels are also examined, and patterns of different colors are created in more limited palette to best represent the original colors.”

The dithering process is basically a process, which tries to find the closest color in an image with thousands of colors and transform it to an image with 256 colors. This process usually results in an image with noise (i.e. millions of points on the image) or composed of scattered pixels (big pixels). To avoid this, it is recommended to use an Adaptive Palette to convert an image with millions of colors to 256 colors.

Here is a sample of a Mac system palette

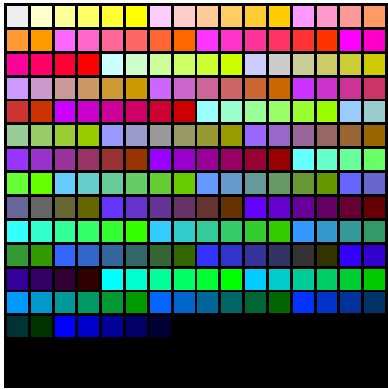


Here is a sample of a Windows95 system palette



Gillespie, J. (1999). *Graphics and palettes*. In: <http://www.wpdtd.com/wpdgraph.htm> - saved as an 8-bit GIF file with its own palette.

This is an example of a **web-safe color** palette, where both Mac and Windows share 216 colors.



The 216 web-safe color palette is also known as 6 x 6 x 6 palette or the 6 x 6 x 6 cube because it has only 6 values for red, 6 values for blue and 6 values for green. The designer cannot change this palette. In the 216-color palette the RGB (red green blue) values are formed from variations of 00, 51, 012, 153, 204 and 255. The values in the web-safe color palette are formed from variations of: 00, 33, 66, 99, CC and FF, this is called the hexadecimal value.

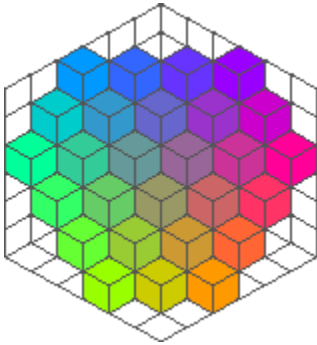


Figure from William I. Johnston - <http://world.std.com/~wij/color/index.html>

Every color in RGB has a hexadecimal value that are used in Web design to convert RGB values, then HTML can read and convert which color was designated. For instance, the color **Red: 255 Green: 00 and Blue: 51**, will have the hexadecimal value: **FF0033**.

%	0%	20%	40%	60%	80%	100%
Dec (RGB)	00	51	102	153	204	255
Hex	00	33	66	99	CC	FF

Using the web-safe color palette is highly recommend by Weinman, but she has the following comment that is good advise “*The Browser-Safe Palette is useful for flat-color illustrations, logos with flat-color, and areas in any image that have a lot of a single color. When a browser dithers flat colors it looks far more objectionable than when it dithers photographs. This CLUT is only useful for flat-color style illustrations, logos, and large areas of flat color. Use it to load into the Photoshop Swatches Palette for this purpose. Do not use it to remap color photos or photographic-style images.*”

In conclusion, in designing web pages keep in mind you audience and try as far as possible to use the web-safe color palette for your main work. You can create your own web-safe palette in most paint applications, like, Photoshop, paint shop pro, freehand, illustrator, painter and photo-paint or you can also go to Lynda Weinman web site and download her selection of non dithering palette for Mac or Windows.

<http://www.lynda.com>

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<http://www.netscapeworld.com/common/nw.color.html>
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<http://www.adobe.com/newsfeatures/palette/main.html>
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Other (very) useful related sites:

<http://www.visibone.com>

<http://www.connect.hawaii.com/hc/webmasters/Netscape.colors.html>

<http://www.w3.org/Conferences/WWW4/Papers/53/gq-boston.html>

<http://lightsphere.com/colors/>

<http://home.flash.net/~drj2142/>

<http://www.utexas.edu/learn/pub/colors/>

<http://world.std.com/~wij/color/wk-03-wb.html>

<http://the-light.com/netcol.html>

http://www.primenet.com/~thoward/clrs_hue.html

<http://www.lynda.com/hexh.html>

<http://www.lynda.com/hexv.html>

<http://www.oberhavel.de/pagemill/Tiptech/pages/main9.htm>

http://kresch.com/resources/browser_safe.htm

<http://www.builder.com/Graphics/CTips/ss01d.html>

<http://www.geocities.com/Heartland/Plains/6446/netscape.html>

<http://www.crackpot.com/palette1.html>

<http://golum.csu.edu.au/~idavidso/web04.html>

<http://www.killersites.com/1-design/index.html>

<http://webdesign.about.com/compute/webdesign/msubcolor.htm>

<http://www.adobe.com/support/techdocs/126f6.htm>

<http://www.sirius.com/~industry/consider.html>

<http://www.utexas.edu/learn/pub/colors/>

<http://world.std.com/~wjj/color/index.html>

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