

Software Tools for the Effective Use of Color in Web Designs

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1. Web Design and the Use of Color

The Web offers an unprecedented opportunity to provide valuable resources to older adults, especially those who are isolated, homebound, or live in remote areas. Unfortunately, there may be barriers that impede the use of the Web when taking into account vision. One such barrier is the use of color when designing a Web page. Those users who have color deficient vision or vision degradation due to normal aging may be negatively impacted by background and foreground color selections.

For an adult who is sixty years or older, visual acuity, contrast sensitivity, visual field, and the ability to discern colors degrade (American Foundation for the Blind, 1999; Echt, 2002). The pupil of an aging eye becomes smaller and the lens yellows and becomes more opaque. Less light enters the eye making it difficult to see all colors in the spectrum especially those in the blue range. Degrading visual acuity reduces the ability to resolve fine details, which is affected by color choices associated with fonts, links, and other Web objects on a page. Computer glare compounds the problem particularly when a Web page is crowded with objects. Because of these factors, the wrong color choices may result in a Web page that is difficult if not impossible to see by targeted users. For older adults, these include color combinations that are of the same hue or desaturated (pastels).

For a person with color-deficient vision, some of the colors in the visible spectrum are not seen. Many color-deficient individuals have dichromatic vision in that only some of the colors are visible (refer to Rigden (1999) or Hess (2000) for an in-depth explanation). A color deficient person may not see red, green, or blue color in the visible spectrum of colors. Others may have a mild color deficiency called anomalous trichromasy. It impacts how they see certain colors in the spectrum.

For those with color-deficient vision, there are foreground and background color combinations that make discrimination of objects on a page difficult. This is especially the case for colors selected from the same part of the color spectrum (e.g., red and orange). Color combinations that are not sufficiently different, in terms of light and dark contrast, may also impede the use of a Web page.

Because Web pages are highly visual media, the use of color should meet the vision needs of all targeted users. The selection of foreground and background colors is an important aspect of Web design. Together, both colors provide cues regarding the functionality of a Web page in terms of content, navigation, searches, and others. The good use of color includes foreground fonts, links, images, and other overlaying objects. Background colors may detract from the visualization of foreground objects when there is insufficient contrast between them.

An effective Web design does not use color alone to relay information. This is the case for both textual and graphic information displayed on a page. A test for effective visibility is to remove color from a Web design and display it in black (or grayscale) and white combinations.

2. Software Tools

The vision software tools that have been developed to support this research will be displayed as part of the poster session. The Graphic Analyzer tool has been developed to promote Web-accessible designs for those who have color-deficient vision. The Aging Vision Simulator tool has been developed to promote Web-accessible designs for those who have aging vision.

The Graphic Analyzer tool automatically translates a color, viewed by a person with normal vision, to one seen by a color deficient person. Translating one color to another isn't an easy task given that there are 16,581,375 different colors. The Graphic Analyzer employs neural network technology to

do this. It learns to perform color transformations by training it with many instances of trichromatic to dichromatic color transformations (Brettel, 1999). The tool displays both the before and after transformation images to highlight the visual differences.

The Aging Vision Simulator tool shows an image as it would be seen by an older adult (60-75 years) and an older, older adult (75 plus). The tool darkens and yellows an image to show the impact of aging on viewing graphics on a Web page. The tool provides Web development insight to promote the effective use of graphics on a Web page.

It is important to note that the user's computing environment (e.g., monitor) may have an impact on the image such that it appears darker or more yellow than actually seen by an aging adult. Computer glare will also impact visualization of the image. These issues are the same ones that face an older adult when viewing Web pages.

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