Optimizing Digital Content for Color-Blind Audiences Using Enhancement Algorithms

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Around 7% of the world's population is color-blind. The aim is to determine the most effective algorithm to optimize digital content for color-blind viewers and to develop an application that automatically optimizes visual content for the color-blind. Several devices contain 'accessibility features' for the visually impaired. Techniques such as the use of contrasting colors, reading modes and selective color elimination solve the problem to some extent. However, these are localized and limited. MATLAB image-processing algorithms were used to identify the best combination of color-separation and correction procedures. The experiment parameters included different color-spaces (HSV, CIELAB, sRGB, LMS), algorithms and enhancement ratios. Algorithms were also developed to simulate Deuteranopic, Protanopic and Tritanopic color-blind vision in order to find the reverse process for preserving detail. The developed combinations were evaluated by calculating the extent of deviation and detail preservation from the original image in the processed images. MATLAB programs were developed to plot deviation graphs and calculate average deviation and detail preservation for various images. Finally, algorithms were tested with color-blind users to determine the best method for color-correction. A novel, tested, universal and configurable algorithm for color-correction was thus established. The algorithm was found to run optimally on a wide range of devices, including smartphones and computers, and a browser-plugin was developed to make the algorithm universally compatible. The algorithm can be built into devices as an accessibility feature and has been proven to enhance color-blind perception on computers.

Awards Won:

Fourth Award of $500