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Image Enhancement Based on Color Histogram and DCT Approach

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Abstract

This paper presents a new approach for color enhancement of the images that is based on the compressed domain technique and histogram equalization. My proposed technique is simple but more effective than some of old existing techniques like AR, MSE and SF-CES. We use the treatment of the chromatic components, while previous techniques treated only the luminance component.

Also it is computationally more efficient than the spatial domain based method, so it is provide better color enhancement compressed domain based approaches.

Index Terms—Color image processing, Color histogram, DCT, Segmentation, Color model, Color enhancement.

I. Introduction

Human color perception adds a subjective layer on top of underlying objective physical properties-the wavelength of electromagnetic radiation. Consequently, color may be considered a psychophysical phenomenon. The human visual system can distinguish hundreds of thousands of different color shades and intensities, but only around 100 shades of grey. Therefore, in an image, a great deal of extra information may be contained in the color, and this extra information can then be used to simplify image analysis, e.g. object identification and extraction based on color. The saturation is determined by the excitation purity, and depends on the amount of white light mixed with the hue. A pure hue is fully saturated, i.e. no white light mixed in. Hue and saturation together determine the chromaticity for a given colour. Finally, the *intensity* is determined by the actual amount of light, with more light corresponding to more intense colors[4].

Achromatic light has no color - its only attribute is quantity or intensity. Gray level is a measure of intensity. The *intensity* is determined by the energy, and is therefore a physical quantity. On the other hand, brightness or luminance is determined by the perception of the color, and is therefore psychological. Given equally intense blue and green, the blue is perceived as much darker than the green. Note also that our perception of intensity is nonlinear, with changes of normalized intensity from 0.1 to 0.11 and from 0.5 to 0.55 being perceived as equal changes in brightness. Color depends primarily on the reflectance properties of an object. We see those rays that are reflected, while others are absorbed. However, we also must consider the color of the light source, and the nature of human visual system. For example, an object that reflects both red and green will appear green when there is green but no red light illuminating it, and conversely it will appear red in the absence of green light. In pure white light, it will appear yellow (= red + green).

II. Objective of the Paper

The objective of my work is to enhance the color image with the help of histogram and discrete cosine transform for improve the visual quality of the image. In this paper we propose a algorithm based on color appearance. We aim at providing an efficient high-quality JPEG color image enhancement algorithm, in terms of color boosting and low computational cost. Our aim is to enhance the color images under compressed domain and histogram equalization. Most of the enhancement algorithms we use today only apply in gray scale format.

We chose DCT for compression as it works best in image enhancement applications. Enhancement can be done by adjusting the background illumination according to better human vision and by preserving the color and the contrast. The compression artifacts which occur during compression actions can be removed using better algorithms available today. The method is relatively simpler than other spatial and frequency domain methods available and found computationally efficient.

III. COLOR SPACE

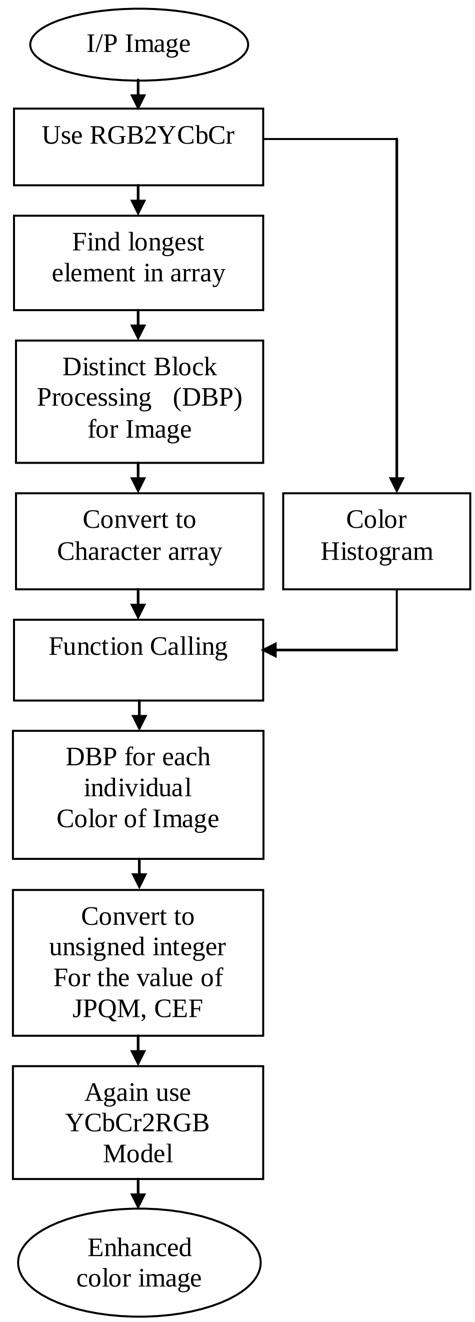
A color space is mathematical representation of a set of colors. The three most popular color models are RGB (used in computer graphics); YIQ; YUV; YCbCr (used in video system) ; CMYK (used in computer printing) . The two most commonly used representations are 8-bit greyscale and 24-bit color. 8-bit grayscale contains 256 shades of grey ($2^8 = 256$) with 0 normally denoting black and 255 denoting white, with other values representing intermediate shades of grey. 24-bit color is simply stored as 3-bytes denoting the red, green and blue components of the color:

For science communication, the two main color spaces are RGB and CMYK. It is worth mentioned that color can be stored in a variety of other ways, each of which have their own advantages and disadvantages: HSI (Hue, Saturation, and Intensity), CMY (Cyan, Magenta, and Yellow), Normalized RG, CIE, YIQ and a lot more.

Colormodels provide a standard way to specify a particular colour, by defining a 3D coordinate system, and a subspace that contains all constructible colors within a particular model. Any color that can be specified using a model will correspond to a single point within the subspace it defines. Each color model is oriented towards either specific hardware (RGB, CMY, YIQ), or image processing applications (HSI).

IV. PROPOSED ALGORITHM

The proposed algorithm performs the color image enhancement operation in three steps. First, it adjusts the background illumination. The next step preserves the local contrast of the image and the last one preserves the colors of the image.



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V. EXPERIMENTAL RESULT

Some images are showing in below fig.1 and determine the value of JPQM, CEF and Histogram.

Table 1 show the JPQM and CEF analysis of above images for better enhancement.

Images	JPQM	CEF
Img1	8.58	0.90
Img2	7.00	0.94
Img3	7.92	0.97
Img4	8.700	1.13

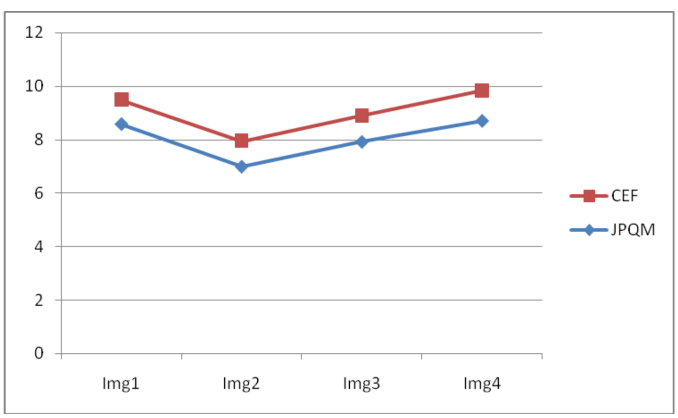

Fig. 2

VI. Conclusion and Future Work

In this paper, we have presented a simple approach for enhancing color images in the DCT and histogram. The unique feature of this algorithm is that it also treats chromatic components in addition to the processing of the luminance component improving the visual quality of the images to a great extent.

In future, we can include this color image enhancement function in MATLAB's Image Processing Toolbox for improving the image quality. In future work, we look forward to addressing how our technique may be integrated with other interactive methods and parameters such as processing speed , Edge Orientation, PSNR etc.

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