A Pigment Fortification tactic for Humanoid Imagining

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ABSTRACT

Pigment fortification of an Image is a promptly emerging ground which finds more and more application in various information as well as methodological systems such as: radar-tracking, communications, televisions, biomedical image etc. Any computer graphics system can't be ideal for all of its applications. The red, green and blue colors (RGB) are highly interrelated. Unfortunately these make difficult to execute the image treating algorithm. So maximizing the use of the bits or bandwidth relative to how Humanoids perceive light and color is a predominant thing. Hominoid vision under common enlightenment conditions follows an approximate power function. Gamma encrypting is a technique to improve the image quality for humanoid picturing but it does not improve the quality when the images need to be darkened or brighten. Though, this is not a good idea to brighten images all the time when better Humanoid Imagining can be obtained while darkening the images using proposed model. Better Humanoid Imagining is important for manual image handling which leads to compare the outcome with the semi-automated or automated one. Making an allowance for the significance of gamma encrypting in image handling we propose a new method of image analysis approach which will improve visual quality for manual handling as well as it will lead analyzers to analyze images automatically for comparison and testing purpose.

Keywords: Color Models, Humanoid Imagining, Pigment Fortification

I. INTRODUCTION

Color model system is used to represent color. Moreover, it is a mathematical model which is used to describe how colors can be represented. Color space is used to describe how the components are to be interpreted. Colors can be seen as variable combinations of primary colors. Primary colors of light are additive and hence additive primary colors are red, green and blue. Combinations of R+G+B creates white. Moreover, primary colors of pigment are subtractive and hence subtractive primary colors are cyan, magenta and yellow. Combinations of C+M+Y create black [1].

There exist several methods to specify a color quantitatively, among extensively used is RGB color model where 3 different colors are added together in different ways to produce a wide range of colors. As for example for a 24 bit RGB color image, a total number of colors can be $(2^8)^3 = 16,777,216$.

RGB color model is used to represent and display images in electronic systems. It is to mention that RGB color model is device dependent as Red, Green and Blue levels are different from manufacturers to manufacturers [2]. Sometimes these colors vary even in same devices over a period of time and hence without a color management RGB color value does not acts as same in devices.

To improve the quality of visual perception for color images, the term image fortification is an important factor [3]. Image fortification is needed in many areas such as photography, scanning, image analysis etc. Image fortification approaches fall into two broad categories such as spatial domain and frequency domain methods [4].

The term spatial domain refers to the image plane itself, and approaches in this category are based on direct manipulation of pixels in an image whereas frequency domain treating techniques are based on modifying the Fourier transform of an image.

Images can be gray-level images or color images. Comparing with color images gray-level images have got only one value for each pixel as images are made with pixel representation. There are many existing algorithm available which helps to enhance the image contrast for gray-level images considering piecewise-linear transformation function named contrast stretching with normalization, stretching with histogram techniques. Most of these available algorithm are not suitable for color images although they are used widely having poor quality and distorted effects [5].

Gray level transformation is proved to be better approach than any other transformation and hence most proposed methods are based on spatial domain approach. Image fortification using spatial domain works with gray-level transformation or power law transformation. Power law equation is referred to as gamma.

S = Cr^{γ} where c and r are positive constants. Value of c= 1 and the value of gamma can vary to set the desired result and the process used to correct power-law transformation phenomena is called gamma correction or gamma encrypting.

However, it is to mention that, only enhancing the image does not improve the image quality for better visual perception. Sometimes it is needed to darken the bright images to obtain a better Imagining [6]. Gamma is one of the main factor which helps to brighten or darken an image.

II. METHODOLOGY

We have proposed gamma encrypting technique using spatial domain instead of frequency domain approach. Again, as mentioned earlier in RGB, there are three primary colors considered named Red, Green and Blue where RGB is defined as additive or subtractive model and hence different colors can be preformed using the combination of these primary colors. The RGB color model is standard design of computer graphics systems not ideal for all of its applications.

The red, green, and blue color components are highly correlated. This makes it difficult to execute the image treating algorithms. Many treating techniques work on the intensity component of an image only. These processes are standard implemented using the HSI color model. In HSI color model, color in decomposed in hue, saturation and intensity value and thus easy for Humanoid Imagining. The HSI model describes more exact color than RGB model describes for Humanoid interpretation [7].

Hue is the main attribute of a color and thus decides which color the pixel has obtained. However, hue should not be changed at any point because changing the hue changes the color as well as distortion occurs in the image. Moreover, comparing with color space like CIE LUV and CIE Lab, in HSB it is easy to control hue and color shifting. Our main approach is to preserve the hue and apply better Humanoid Imagining using saturation and brightness and hence we have chosen HSI color space instead of other color space.

As mentioned earlier that image are prepared in the medical laboratory are RGB images. It is important to convert the RGB images into HSI images so that we can have hue, saturation and intensity in differently. Our main goal is to change the properties of Saturation and Intensity and preserve the hue, so we have chosen the HSI color model for better Humanoid Imagining instead of choosing other color model.

III. COLOR MODEL CONVERSION

a. RGB to HIS

Equation (1) describes the conversion from RGB to HSI color space.

$$I = \frac{1}{3}(R+G+B) \tag{1}$$

$$S = 1 - \frac{3}{(R+G+B)}\left[\min(R,G,B)\right] \tag{2}$$

$$H = \cos^{-1}\left\{ \frac{0.5\left[((R\_G)+(R-B))\right]}{\sqrt{(R-G)^2+(R-B)(G-B)}} \right\} \tag{3}$$

If B is greater than G, then H=360°-H (4)

Where R, G and B are three color component of source RGB image, H, S and I it's components of hardware independent on HSI format [8].

b. HSI to RGB

As it can be seen that conversion from RGB to HSI is not easy with regard to computing algorithm complexity because it's regarding minimum from three searching (expression 1, as minimum two operators of condition), long cosine function, square root, square computation, additional operation of condition (expression 4) during one pixel conversion.

More difficulty to convert from HSI color space back to standard RGB, where the process depends on which color sector H lies in. For the RG sector ($0^0 \le H \le 120^0$), we have the following equations to convert RGB to HSI format:

B=I(1-S) (5)

$$R = I\left[1+\frac{S\cos H}{\cos(60^0 - H)}\right] \tag{6}$$

G = 3I − (R + B) (7)

For the GB sector ($120^0 \le H \le 240^0$):

$H = H - 120^0$ (8)

R = I (1− S) (9)

$$G = I\left[1+\frac{S\cos H}{\cos(60^0 - H)}\right] \tag{10}$$

B = 3I − (R +G) (11)

For the BR sector ($240^0 \le H \le 360^0$):

$H = H - 240^0$ (12)

$$G = I(1 - S) \quad (13)$$

$$B = I\left[1 + \frac{S\cos H}{\cos(60^o - H)}\right] \quad (14)$$

$$R = 3I - (G + B) \quad (15)$$

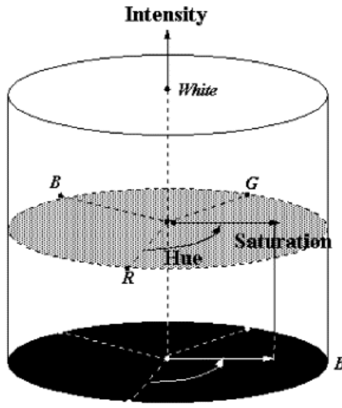

Fig 1: Cylindrical Color Space of HSI format

IV. GAMMA ENCRYPTER

It is wise to use luma which represents the brightness in an image and can be denoted as Y. Luma is weighted average of gamma-encrypting which can be denoted as Y' for R,G and B and hence denoted as R'G'B'.

The equation becomes,

Y=0.2126R+0.7152G+0.0722B for luminance

Y'=0.2126R'+0.7152G'+0.0722B' for gamma encrypting

For better Humanoid Imagining, the contrast fortification operation based on the manipulation of the image histogram is histogram equalization.

Initially, we will assume a grey-scale input image, denoted $I_{input}(X)$ If the variable x is continuous and normalized to lie within the range [0,1], then this allows us to consider the normalized image histogram as a probability density function (PDF) $p_x(X)$, which defines the likelihood of given grey-scale values occurring within the vicinity of x.

Similarly, we can denote the resulting grey-scale output image after histogram equalization as $I_{output}(X)$ with corresponding PDF Py(y).

A standard result from elementary probability theory states that:

$$p_y(y) = P_x(x)\left|\frac{d_x}{d_y}\right| \quad (16)$$

which implies that the desired output PDF depends only on the known input PDF and the transformation function y=f(x). Consider, then, the following transformation function, which calculates the area under the input probability density curve (i.e. integral) between 0 and an upper limit x:

$$y(x) = \int_0^x p_x(x)' d_x' \quad (17)$$

Differentiating this formula, applying Leibniz's rule and substituting into our previous statement we obtain the following:

$$p_y(y) = p_x(x)\left|\frac{1}{p_x(x)}\right| \quad (18)$$

Finally, because px(x) is a probability density and guaranteed to be positive ($0 \le px(x) \le 1$).

we can thus obtain [1]:

$$p_x(y) = \frac{p_x(x)}{p_y(y)} = 1 \qquad 0 \le y \le 1 \quad (19)$$

V. PROCESSING STEPS

This experiment is divided into following steps considerations for better Humanoid Imagining.

1) Selection of a color image in RGB format.
2) Get the values (r,g,b) for each pixel for that specific image.
3) Conversion of RGB color image to HSI color image.
4) Gamma encrypting applied for brightness or darkness for better Imagining.
5) Saturation value applied using histogram equalization.
6) Conversion of HSI color image to RGB color image.
7) Save and use the resultant image for other image analysis.

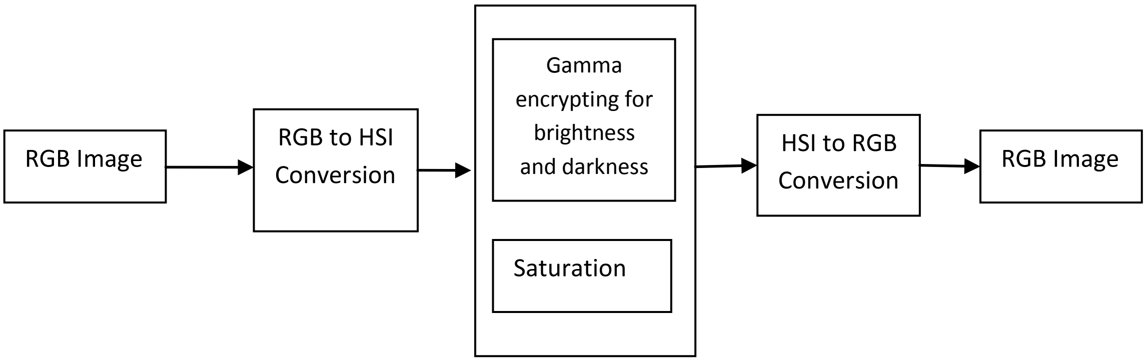

Fig 1: System Block Diagram

VI. EXPERIMENTAL RESULTS

Histogram Equalization method applied to the original color images where this method changes the color value (hue) of the original images. It is known that majority methods of image treating working only with intensity part of color model [9-11].

The color model must be in full basis, it mean that model must allow to transform image to new color model, use the intensity component for image treating then return image back to RGB after treating [12,13].

To evaluate the performance of our proposed method, Gamma encrypting helps to maintain the visual quality of images. To evaluate the contrast performance we have applied histogram equalization saturation value from 0.4 – 0.6 and gamma correction value ranges from 0.75 – 2.2 in different computers as different computers acts different according to gamma value.

It is to mention that gamma value > 1 performs darkening and vice-versa. In this section we present a hue preserving gamma encrypting method based on the HSI color space. A comparison among our proposed method and the image fortification method is carried out as shown in Fig. (1-3).

Fig. 1 shows the results for the first image, "John Coltrane" where the image fortification technique generated a darken image (Fig. 1(b)). In turn, the image produced by our proposed method (Fig. 1(c)) is more realistic than the others. We can say that the resulted image of gamma encrypting method has better quality than the others.

Fig. 2(b) shows the results for the second image, the original image produces an over enhanced image, that is, the colors are very saturated.

In Fig. 2(c) our method generates an image with a good balance between non saturated and realistic colors.

From the discussion above, we claim that our method produces images (Fig (1(c)-3(c))) with the best tradeoff between the enhanced colors and saturation.

That is, our method produces images with colors that are more realistic than the image fortification technique (which are not hue preserving), and the images are not as saturated as the ones produced by the method.

Fig 1(a): Original Image

Fig 1(b): Histogram Equalization

Fig 1(c): Proposed Method

Fig 2(a): Original Image

Fig 2(b): Histogram Equalization

Fig 2(c): Proposed Method

Fig 3(a): Original Image

Fig 3(b): Histogram Equalization

Fig 3(c): Proposed Method

VII. COMPARISON

Table 1: Comparison of existing and proposed method with accuracy

Method Used	Number of Images	Error (%)	Accuracy (%)
Existing Method	20	26%	74%
Proposed Method	20	13%	87%

VIII. CONCLUSION

This paper has proposed a pigment fortification tactic using luminance component based on Humanoid Imagining as well as saturation component. As shown on the experiments in the previous section, it is difficult to judge an enhanced image result even with a subjective assessment. However, we claim that our method is more robust than the others in the sense that neither unrealistic colors nor over enhanced are produced. For future works, we plan to evaluate the methods using naturalness and colorfulness metrics on a database with hundreds of images collected from internet, such that a quantitative comparison can be performed.

However, there may be still some areas needs to be taken care of as the pigment fortification needs to change or shift color using hue although these cases are exceptional and very rare.

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