

A Novel Based Equalization Model for Contrast Images with Enhanced Video Processing

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Abstract: With the progress of technologies and the popularity of imaging devices, billions of digital images are created every day. Because of detrimental environment, the nature of the image is not satisfactory. As a result, image enhancement is needed. To date, contrast enhancement process plays an important role in enhancing image's quality. Several previous studies proved that contrast enhancement techniques capable to clean up the unwanted noises and enhance the image's brightness and contrast. In this paper, we combine both grey balancing and contrast enrichment to accomplish good tone even as preserving contrast of an image using linearity and non-linearity functions of histogram transform.

INTRODUCTION

Digital images are the major source of knowledge in today's real world, because of their easy acquisition and storage. These images can be used as an evidence for any event in the court of law; images broadcasted in any TV news are accepted as a certificate for the trait of that news. Digital images are employed in several applications such as military, biometric signature, medical diagnosis, and surveillance video system. Because of undesirable environment, the captured image are not always satisfactory. Generally, the real image is stored in the RAW format. So tone mapping technique is required. Usually tone mapping algorithms can be classified into two types namely

- 1) Grey Balancing: due to the physical constraint of inexpensive imaging sensors, the obvious color bias has been carried out by the captured image. so there may be a chance of color constancy [18] ,[21]. For that reason linear transform is required to map the real image into a perfect one.
- 2) Contrast enrichment: contrast enrichment algorithms are mostly used for restoring the besmirched media, among that global histogram equalization is the best choice.

Both contrast and neutral balancing has mutual impact of an image. At present, the image enrichment system separates grey balancing and contrast enrichment as two different phases. Even if tone has adjusted in the grey balancing phase, then contrast enhancement may bias. achieving contrast enrichment by maximizing the saturation of an image, it may cause tonal distortion. Even if both are originated from dissimilar applications, grey balancing and contrast enrichment is required for

tone strategy process. In reality all algorithms of grey balancing and contrast enrichment are based on histogram transformation.

RELATED WORK

In this aspect, P. milanfar[7] has proposed spatial filtering based enrichment methods, which includes non-local mean filter, bi-lateral filter, steering regression etc. J. van de weijer et.al[9] has been proposed a integrated model for color constancy based on low-level visual information. X. Wu[13] has introduced a method called OCTM(optimal Contrast-Tone Mapping) to solve contrast enrichment problem by maximizing the contrast gain. ZhiYu Chen et.al[12] developed a new automatic contrast enhancement technique called GLG(Grey Level Grouping). it is a general and powerful technique, which can be conveniently applied to a broad variety of low-contrast images and generates satisfactory result. Ji-Hee Han et al[14] has compared the performance of color histogram equalization methods based upon the 3-D histogram in RGB color space and analyzed the theoretical basis for the brightening or over equalization effect of the Trahanias algorithm by presenting intensity cdf and pdf.

In this paper, we are going to discuss the relation between grey balancing and contrast enrichment of an image using histogram transform based on linearity and non-linearity function.

COMPREHENSIVE EQUALIZATION METHOD

The main aim of generalized equalization model is to achieve both grey balancing and contrast enrichment problems which can be described in the form of image histogram transform. If the transform is inclines as linear, the outcome is nearer to grey balancing. In the meantime, if the transform is inclines as non-linear, the outcome is nearer to contrast enrichment.

Assume that an image $I = (I_r, I_g, I_b)T$. The dynamic range of I_c is $[0, F_c]$, $c = r, g, b$. the histogram of image is represented as $\{h_c, p_c\}$. here, $h_c \in L^k$ denotes the K intensity levels that corresponds to probability vector $p_c \in L^k$. K is the number of intensity level whose possibility value is non-zero integer. consider the histogram of real image represented as $\{h_c, p_c\}$.

A) HISTOGRAM ANALYSIS BASED ON GREY BALANCING

Grey balancing is one of the most important image enhancement method with colorconstancy. Here we emphasis on low-level approach to establish a relationship between the histogram and color constancy of an image.

In the lambertian model,the image is represented as

$$I_c = \int r(\lambda)l(\lambda)m_c(\lambda)d\lambda \tag{1}$$

Therefore, λ is wavelength of light. $r(\lambda)$ is reflectance of surface, $l(\lambda)$ is the light source, and $m_c(\lambda)$ is the sensitivity of camera in the channel c.the aim of color constancy is to evaluate the prognostication of light source on the RBG space. For instance, the histogram of grey balancing result is represented as

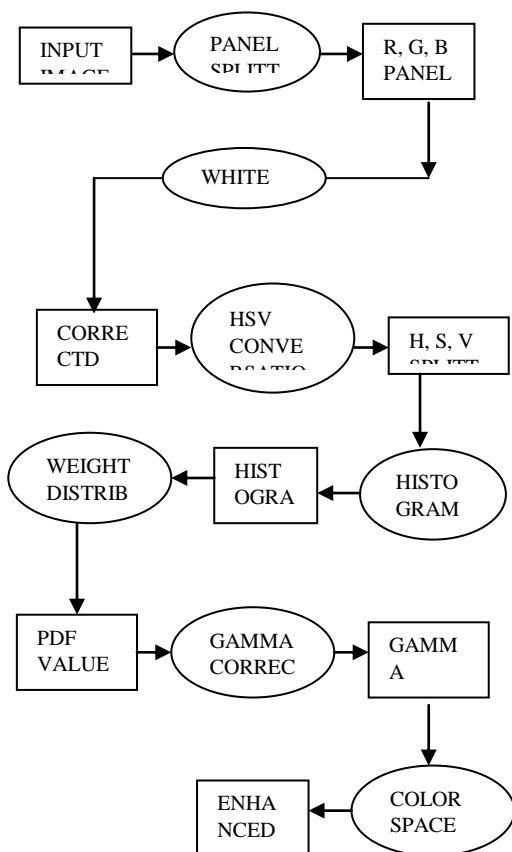
$$\widehat{h}_c = \frac{1}{e_c(\lambda)\sqrt{3}} \widetilde{h}_c$$

B) HISTOGRAM ANALYSIS BASED ON CONTRAST ENRICHMENT

In [43], the estimated context-free contrast of image is well-defined as,

$$C = P_c^T S_c \tag{2}$$

C) JOINT GREY BALANCING AND IMAGE ENRICHMENT



The comprehensive model provides a joint strategy for image enrichment. If β as a small positive range, then we can combine grey balancing and enhancement into a hybrid algorithm. Tone mapping for HDR image is another application. Most of the tone mapping algorithms are based on local adaptive filtering, a primary method called gamma correction, is quiet the most widespread choice due to its robustness and lower complexity. Also gamma correction avoids tone bias and protects the color of an image. By applying gamma correction, the brightness and contrast of the display are enriched, making the images appear brighter and more natural looking.

CONCLUSION

In this paper, we discussed the relationship between grey balancing and contrast enrichment through the linearity and non-linearity functions of histogram transform using a comprehensive equalization model. The comprehensive equalization model keeps a balance between the contrast enrichment and grey balancing. If the transform is non-linear, then it is related to contrast enrichment, if the transform is linear, then it is related to grey balancing. In future, we expect more general image enhancement methods into the model through image attributes examination.

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