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Technically Improved Image and Video Enhancement using Adaptive Gamma Correction with Weighing Distribution Based Contrast Enhancement Techniques

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ABSTRACT

Images were captured, transformed, transferred and broadcasted every second in our daily life, Processing of digital images were kept on the top priority since digital images occupies vast areas in facial recognition, pattern recognition, remote sensing, medical evaluation, weather broadcasting etc. In this paper we discuss about the processing algorithm of single frame images and images in videos by segmental image analysis through adaptive gamma correction techniques. The aim of this paper deals with the processing of raster images that were scrambled/pixelated by gamma exposure. Since human eyes can be sensitive to over and under exposed gamma error in images, proper computer segmentation and procession is essential. There are a wide range of techniques available for image enhancement, rather here we used weighting distribution based contrast enhancement evaluation and processing can be identified precisely. An automatic transformation technique that improves the brightness of dimmed images via the gamma correction which enhance the image contrast through use of smoothing curve and probability distribution of luminance pixels. Finally, the paper concluded the procedural programming used to process an image though adaptive gamma correction.

Keywords: Adaptive Gamma Correction Weighted Distribution (AGCWD), Histogram Modifications, Transformed-based gamma correction (TGC).

1. INTRODUCTION

Evolution of digital cameras created a massive boom in the field of visual communication, capturing daily life images and in filming. The most extensive achievement of digital images was on social media exposure. Since these factors were in major concern, it is essential to maintain the qualities like resolution, contrast, hue, luminance etc., which decides the features of an image. The captured image can be affected by atmospheric change, poor device capability, lack of expert operator etc. The captured image can be affected by atmospheric change, poor device capability, lack of expert operator etc. Since image enhancement is mostly expected in sensitive fields like Analyzing satellite images, Astrophotography, remote sensing, medical image processing, synthetic texture analysis, surveillance and video processing in media. Enhancement of processing in media. Enhancement of images deals with saturation, sharpness, demising, tone variation, Balance, colour correction etc. Image quality enhancement technique that adopted was to improve the overall look of the image through advanced gamma correction through weighted distribution. This helps to obtained proper-laminated images from poorly laminated images. Since good effect of vision is needed for obtaining an improved effective image, which is necessary for a good quality with better size in images. Lots of practical applications includes thermal imaging, radar images, robotic vision, satellite imaging, water path imaging in GIS etc. In this paper we discuss about the enhancement of image through adaptive gamma correction and Histogram equalization techniques.

2. LITERATURE STUDIES

In recent periods, Digital Image Processing became the vast known research topic with advanced protocols. Lots of research's, investigations and developments were developed for various models in image enhancement and gamma control.

T.Celik and T.Tjahjadi (2012) developed an adaptive image equalization algorithm that automatically enhances the contrast in an input image. The algorithm uses the Gaussian mixture model to model the image grey-level distribution, and the intersection points of the Gaussian components in the model are used to partition the dynamic range of the image into input grey-level intervals. Y. S. Chiu et al. (2011) studied and provided an efficient Histogram Modification method for contrast enhancement, which plays a significant role in digital image processing, computer vision, and pattern recognition. We present an automatic transformation technique to improve the brightness of dimmed images based on the gamma correction and probability distribution of the luminance pixel.

L. Zhang et al. (2011) elaborated his model on Image quality assessment (IQA) that aims to use computational models to measure the image quality consistently with subjective evaluations. The well-known structural similarity index brings IQA from pixel to structure-based stage. F.C. Cheng et al. (2010). The image contrast enhancement has become increasingly essential due to the need to better show the visual information contained within the image for all vision-based systems. This has led to motivation for the design of a powerful and accurate automatic contrast enhancement for a digital image. Histogram equalization is the most commonly used contrast enhancement method. However, the conventional histogram equalization methods usually result in excessive contrast enhancement, which causes the unnatural look and visual artefacts of the processed image. We propose a novel histogram equalization method using the automatic histogram separation along with the piecewise transformed function.

C.L. Liu et al (2009). Inverse gamma correction must be performed before displaying the received video signal because alternating current plasma display panel (ACPDP) has a linear output luminance response to a digital-valued input. The histogram equalization (HE) is an important contrast ratio enhancement method. But sometimes HE can produce unrealistic effects in images. A new method of combining dynamic contrast ratio enhancement and inverse gamma correction for ACPDP is proposed. The dynamic contrast ratio enhancement and the inverse gamma correction are realized simultaneously in the proposed method.

3. ADOPTED METHODOLOGIES

In order to carry out the working process, it is necessary to check the condition of the image. The proper conditioning of an image is done by pre-processing. The most official technique used in the processing of image is image enhancement. This method of processing image shows much more promising quality in images rather compared to the original image.

A. Direct Enhancement Method

In direct enhancement method, the image contrast can be directly defined by a specific contrast term. Most of these metrics cannot simultaneously gauge the contrast of simple and complex patterns in images.

B. Indirect Enhancement Method

Indirect enhancement method attempts to enhance image contrast by redistributing the probability density. In other words, the indirect enhancement method attempt to enhance image contrast by redistributing the probability density contrast term.

C. Histogram Modification Technique

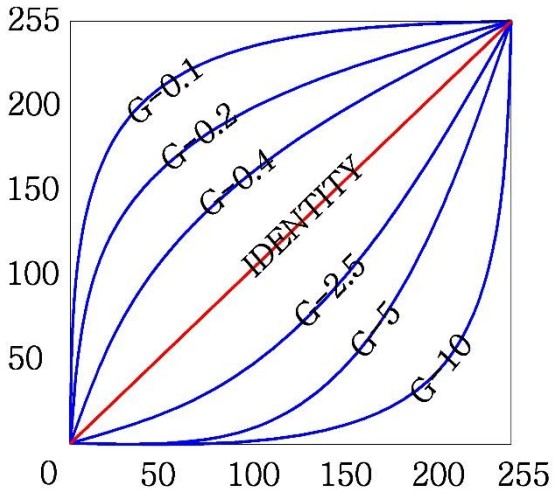
A histogram is a very useful tool to study the distribution of the components of an image but it also allows the contrast and the range of colors for over-exposed or under-exposed images to be corrected. Moreover, its modification does not deteriorate the information contained in the image but makes it more or less visible. Histogram modification (HM).

3.1 GAMMA CORRECTION TECHNIQUES

Gamma correction techniques make up a family of general HM technique obtained simply by using a varying adaptive parameter γ. Gamma correction technique is used to code and decode luminance values in video and image systems. It controls the overall brightness of an image and video. The simple form of the transform-based gamma correction (TGC) is derived by

$$T(l) = l_{max}(\frac{l}{l_{max}})^{\gamma}$$

Where lmax is the maximum intensity of the input. The intensity l of each pixel in the input image is transformed as T (l) in Eq. (1.1). The gamma curves illustrated with γ >1 have exactly the opposite effect as those generated with γ < 1, as shown in Figure (6.1). It is important to note that gamma correction reduces towards the identity curve when γ = 1,



The contrast of an image is directly modified by gamma correction; different images will exhibit the same changes in intensity as a result of the fixed parameter. The probability density of each intensity level in a digital image can be calculated to solve this problem. The probability density function (pdf) is given in Eq. (1.2)

$$pdf(l) = \frac{n_l}{MN} \text{.....(1.2)}$$

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Where nl is the number of pixels that have intensity l and MN is the total number of pixels in the image. The cumulative distribution function (cdf) is based on pdf, and is formulated as:

$$cdf(l) = \sum_{k=0}^{l} pdf(l) \ldots\ldots.(1.3)$$

After the cdf of the digital image is obtained from Eq. (1.3), Traditional Histogram Equalization (THE) directly uses cdf as a transformation curve which is given in Eq.(1.4)

$$T(l)=cdf(l)lmax.\ldots\ldots\ldots\ldots(1.4)$$

It is important to note that the transformation degrades toward the identity line when Pdf is the most uniform with maximum entropy. The method uses the property of the histogram to enhance the intensity contrast, this inappropriate modification is shown in Figure 6.1 Over-enhancement and under-enhancement are indeed major challenges due to the unnatural changes in cdf. The x-coordinate is the input intensity and the y-coordinate is the decrement or increment of each intensity level.

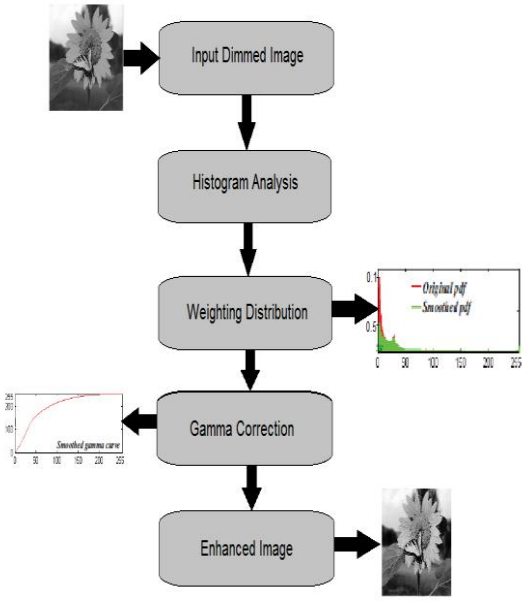

Figure. 1 Block Diagram of AGCWD Method for Image

4. IMPLEMENTATION

Histogram modification (HM) technique is used in the proposed system. It is the most popular indirect enhancement technique due to their easy and fast implementation. A hybrid HM method is proposed to accomplish this goal by efficiently combining the TGC and THE methods. The various HM methods all significantly improved the dark region with the exceptions of RSWHE and AWMHE, which both preserved the low level of brightness as a poor enhancement. For image-contrast enhancement, these methods were applied to enhance various grey scale and colour images.

The proposed Adaptive Gamma Correction (AGC) is used for maintaining the intensity levels of an image. The AGC method can progressively increase the low intensity and avoid the significant decrement of the high intensity.

Normalized gamma function to modify the transformation curve without losing the available histogram of statistics. The gamma parameter generates a more significant adjustment. The Weighting Distribution (WD) function is also applied to slightly modify the statistical histogram. In RSWHE method, a normalized gamma function can be used to modify each sub-histogram to include multi-equalizations with brightness preservation. For the brightness preservation, the modified Absolute Mean Brightness Error (AMBE) is employed to assess the intensity of the enhanced image. TB method can significantly reduce the processing time, with simplification dependent on the temporal similarity of the sequences.

A. *Image Colour Enhancement*

Contrast enhancement of colour images is typically done by transforming an image to a colour space that has image intensity as one of its components. One such colour space is L*a*b*. Use colour transform functions to convert the image from RGB to L*a*b* colour space, and then work on the luminosity layer 'L*' of the image. Manipulating luminosity affects the intensity of the pixels, while preserving the original colours. For the purpose of enhancing the image, there are several methods available. Here we use AGCWD method which is shown below.

B. *Histogram Analysis*

A hybrid HM method is efficiently combining the TGC and THE methods. A normalized gamma function modifies each sub-histogram Gamma correction techniques make up a family of general HM techniques obtained simply by using a varying adaptive parameter. Transform-based Gamma Correction (TGC) is used to enhance the maximum intensity of the input image. Using the fixed parameter, the contrast is modified by gamma correction in different level intensity images. Probability density of each intensity level is calculated with respect to the number pixels in the images. Apply the cumulative distribution function is based on probability distribution function of the image.

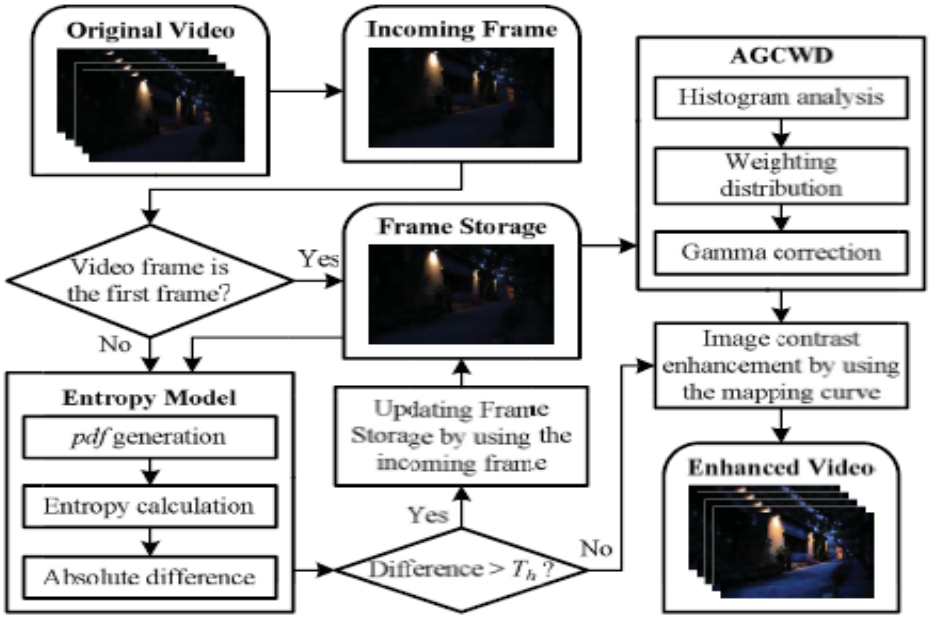

Figure 2 Block Diagram of TB Method for video

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Fig 7.2 Dimmed CNC Image

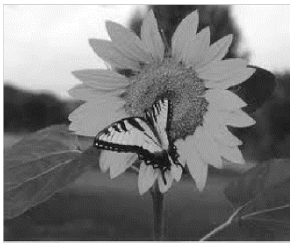

Fig 7.3 Grayscale Image

Fig 7.4 Enhanced CVC Image

Fig 7.5 Histogram CVC Image

Fig 7.6 AGCWD Image

Fig 7.7 Grayscale GC Image

Fig 7.8 Enhanced GC Image

Fig 7.9 AGCWD GC Image

Images with low contrast are improved in terms of an increase in dynamic range. Secondly, the dimmed colour image is converted into grey scale image which is shown in Figure 7.3. The enhancement process is based on the observation that contrast can be improved by increasing the grey-level differences between the pixels of an input image and their neighbors. Images with sufficiently high contrast are also improved but not as much.

5. RESULTS AND DISCUSSION

The entire programming was carried out in Matlab, a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. In every testing of the image, all image enhancement techniques such as Histogram equalization (HE), Adaptive gamma correction weighting distribution (AGCWD) are proposed and used. The weighting distribution (WD) function is applied to slightly modify the statistical histogram and then the gamma correction is applied, Then the enhanced image is obtained. For the proposed system AGCWD, the input image is get as dimmed colour images. For the dimmed image used as input, most of the pixels are densely distributed in the low-level region. The AGC method can progressively increase the low intensity and avoid the significant decrement of the high intensity of input image.

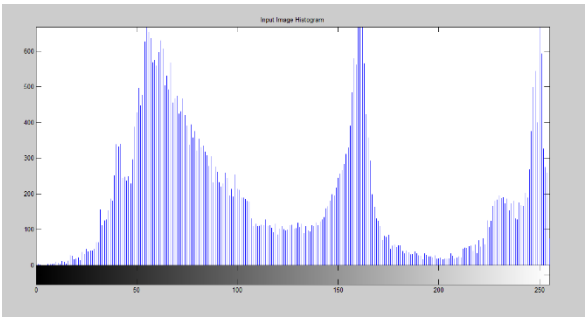

Fig 8.1 Histogram of Input Image

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The histogram equalization enhances the contrast of images by transforming the values in an intensity image, or the values in the colour map of an indexed image, so that the histogram of the output image approximately matches a specified histogram.

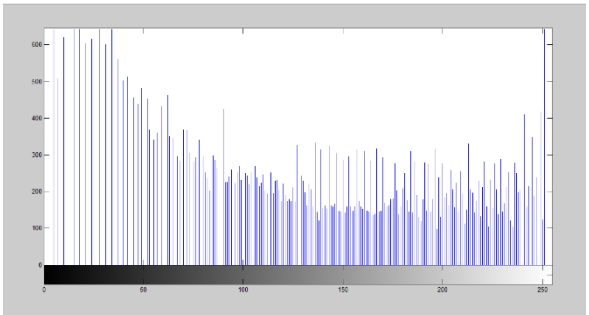

Fig 8.2 Histogram of AGCWD Image

6. CONCLUSION

In this paper, the image enhancement for both images and video sequences is based on AGCWD method and TB method. The proposed method is composed of three major steps. First, the histogram analysis provides the spatial information of a single image based on probability and statistical inference. In the second step, the weighting distribution is used to smooth the fluctuant phenomenon and thus avoid generation of unfavorable artefacts. In the third and final step, gamma correction can automatically enhance the image contrast through use of a smoothing curve. Furthermore, we employed temporal information to reduce the computational time for several image frames of a video sequence. Based on the difference of the information content, the entropy model was used to determine whether or not the transformation curve should be updated. While considering the future work, we use more features for contrast enhancement in both image and video in real time applications.

REFERENCES

[1]. Arici.T, Dikbas.S, and Altunbasak.Y, "A histogram modification framework and its application for image contrast enhancement," IEEE Trans. Image Process., vol. 18, no. 9, pp. 1921–1935, Sep. 2009.

[2]. Celik.T and Tjahjadi.T, "Contextual and variational contrast enhancement," IEEE Trans. Image Process., vol. 21,pp. 3431–3441,Dec. 2011.

[3]. M. Ruban Kingston, N. Muthukumaran, R. Ravi, 'A Novel Scheme of CMOS VCO Design with reduce number of Transistors using 180nm CAD Tool', International Journal of Applied Engineering Research, Volume. 10, No. 14, pp. 11934-11938, 2015.

[4]. B. Manoj Kumar and N. Muthukumaran, 'Design of Low power high Speed CASCADED Double Tail Comparator', International Journal of Advanced Research in Biology Engineering Science and Technology, Vol. 2, No. 4, pp.18-22, June 2016.

[5]. Cheng.F.-C. and Ruan.S.-J., "Image quality analysis of a novel histogram equalization method for image contrast enhancement," IEICE Trans. Inf.Syst., vol. E93-D, no. 7, pp. 1773–1779, Jul. 2010.

[6]. N. Muthukumaran, 'Analyzing Throughput of MANET with Reduced Packet Loss', Wireless Personal Communications, Vol. 97, No. 1, pp. 565-578, November 2017.

[7]. P. Venkateswari, E. Jebitha Steffy, Dr. N. Muthukumaran, 'License Plate cognizance by Ocular Character Perception', International Research Journal of Engineering and Technology, Vol. 5, No. 2, pp. 536-542, February 2018.

[8]. N. Muthukumaran, Mrs R.Sonya, Dr. Rajashekhara and V. Chitra, 'Computation of Optimum ATC Using Generator Participation Factor in Deregulated System', International Journal of Advanced Research Trends in Engineering and Technology, Vol. 4, No. 1, pp. 8-11, January 2017.

[9]. Celik.T and Tjahjadi.T, "Automatic image equalization and contrast enhancement using Gaussian mixture modeling," IEEE Trans. Image Process., vol. 21, no. 1, pp. 145–156, Jan. 2012.

[10]. N. Muthukumaran and R. Ravi, 'The Performance Analysis of Fast Efficient Lossless Satellite Image Compression and Decompression for Wavelet Based Algorithm', Wireless Personal Communications, Volume. 81, No. 2, pp. 839-859, March 2015.

[11]. Hanmandlu.M, Verma.O.P, N. K. Kumar, and Kulkarni.M, "A novel optimal fuzzy system for color image enhancement using bacterial foraging," IEEE Trans. Instrum. Meas., vol. 58, no. 8, pp. 2867–2879, Aug. 2009.

[12]. Ms. A. Aruna, Ms.Y.Bibisha Mol, Ms.G.Delcy, Dr. N. Muthukumaran, 'Arduino Powered Obstacles Avoidance for Visually Impaired Person', Asian Journal of Applied Science and Technology, Vol. 2, No. 2, pp. 101-106, April 2018.

[13]. N. Muthukumaran and R. Ravi, 'Hardware Implementation of Architecture Techniques for Fast Efficient loss less Image Compression System', Wireless Personal Communications, Volume. 90, No. 3, pp. 1291-1315, October 2016.

[14]. B. Renuka, B. Sivaranjani, A. Maha Lakshmi, Dr. N. Muthukumaran, 'Automatic Enemy Detecting Defense Robot by using Face Detection Technique', Asian Journal of Applied Science and Technology, Vol. 2, No. 2, pp. 495-501, April 2018.

[15]. Ms. Mary Varsha Peter, Ms. V. Priya, Ms. H. Petchammal, Dr. N. Muthukumaran, 'Finger Print Based Smart Voting System', Asian Journal of Applied Science and Technology, Vol. 2, No. 2, pp. 357-361, April 2018.