

Efficient Method of Removing the Noise using High Dynamic Range Image

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Abstract— Various tone mapping methods have been proposed to make image better concurrent to human visual observation. In general, tone mapping can also be carried in nearby and/or world features. In this work, a progressive tone mapping framework such as wavelet filter and spongy thresholding are proposed to diminish the noise this 4% quicker than bayshrink process. It's one of a kind curve centred universal tone mapping methods that increase the bright and darkish regions. Peak Signal Noise Ratio (PSNR) value is calculated to know the enrichment value. Simulation outcome show that the proposed schemes achieve high contrast improvement.

Keywords- High dynamic range, Noise reduction, wavelet filter, color reproduction.

I. INTRODUCTION

Tone mapping is a process which is utilized in image processing to map one set of color to one more that is changing excessive dynamic range into limited dynamic variety. Print-outs, projectors LCD or CRT monitors cover a partial dynamic range to reproduces the full series of brightness intensities present in expected scene. This procedure provide solution for the predicament of strong contrast diminution from the image scene radiance to the high range while preserving the image detail and color appearance of the image that is important to the original image content. More than a few tone mapping operators have been established for restricted vibrant range. They all can be divided in main two forms that are Local and Global operators.

Global operators are non linear services based on international variables of the photo and luminance. This technique is unassuming and quick [1] because this operator can implemented by using appear-up tables, but this method can rationale a lack of distinction in an snapshot. In nearby system, non-linear perform alternate in each pixel in line with the elements extracted from the encompassing parameters that is the effect of the algorithm changes n every pixels according to the neighborhood points of the photo. This system is extra elaborate than international ones. This manner can exhibit artifacts that is halo effect and ringing, and the output can look unrealistic, however it could possibly provide the easier performance. Tone mapping methods furnish very sharp photograph, even as preserving the small contrast small print.

Example for this tone mapping approaches are gradient domain high dynamic variety compression[2] and a perceptual frame work for contrast discount of excessive dynamic variety pictures[3]. A further system to tone mapping of excessive dynamic variety pics is accomplished with the aid of the anchoring conception of lightness perception [4]. Chiu et al [5] procedure offered the crisis of visibility loss via making use of

luminance scaling values where the dark and brilliant areas are not merged. This method can provide just right efficiency on shaded parts of an picture, however small vivid function in an image will create powerful attenuation of the nearest pixels.

Pattanaik et al.[6] has been introduced a tone reproduction algorithm that may don't forget sample representation, luminance and colour processing for the human visible procedure .Reinhard et al[7] proposed one operator that recollect zone approach which will divides the luminances into 11 printing zones that is goes from black (zone zero) to white (zone 10). This operator reduces the dynamic variety lower the contrast by highlighting darkening to give a boost to the overall visibility. Tumblin and Rushmeier[8] algorithms interested by tone replica operators to convert scene depth to display intensities. Nevertheless this algorithm had some huge limitations which might be complete darkness in an photograph can also be displayed as grey photograph alternatively of black and it does no longer show the distinction for extraordinarily brilliant portraits.

The paper is organized as follows: Section II present operation of noise reduction .Section III proposed local TM algorithm, the simulation outcomes of the proposed method is discussed in Section IV. The conclusion part has been given in Section V.

II. NOISE REDUCTION

Usually image noise is random variant of brightness of the image or color knowledge in photo, and it is in the form of digital noise. Noise will also be produced by means of the sensor of the digital camera and circuitry of a scanner. Image noise may additionally generate in movie grain and within the removal of shot noise of an ultimate photon detector. Image noise is an undesirable by way of made from snapshot capture in the more than a few environments that adds spurious and extraneous information to the image.

A. High Dynamic Range Image

Most of the computer graphics high dynamic range image cannot be displayed because contrast will be high. So that we can convert high dynamic range into limited dynamic range.. High dynamic range imaging (HDRI or HDR) is a methods which is used to allow a higher dynamic range between the brightest and darkest areas of an image. HDR images can provides more accurately the range of intensity levels of an image, from direct sunlight to faint starlight. HDR is commonly used to display of images derived from HDR imaging.

III. PROPOSED LOCAL TM ALGORITHM

The proposed system gives a simple and amazing system for noise reduction in the tone mapped image by means of utilizing rapid bilateral filter and wavelet thresholding procedure. The proposed tone mapping system includes initial compression, subband decomposition, noise discount and color replica system. Each blocks is described following.

A. Subband decomposition

In this proposed tone mapping method, subband decomposition is done by using daubachies wavelet transform. The initial compressed image can be decomposed by using this daubachies transform, which is applied separately in the X and Y direction and it is iterated upto K-level. The initial compressed luminance ofthe image can be splitted into high frequency subband and ow frequency subband.Tone mapping methods provide very sharp image, while preserving the small contrast details. Example for this tone mapping methods are gradient domain high dynamic range compression[2] and a perceptual frame work for contrast reduction of high dynamic range images[3]. Another method to tone mapping of high dynamic range images is accomplished by the anchoring theory of lightness perception[4]. Normally Image noise is random variant of brightness of the photograph or color information in image, and it's within the form of electronic noise. Noise will also be produced through the sensor of the digital digital camera and circuitry of a scanner. HDR images can supplies more competently the range of intensity phases of an photograph, from direct sunlight to faint starlight. HDR is commonly used to display of images derived from HDR imaging.

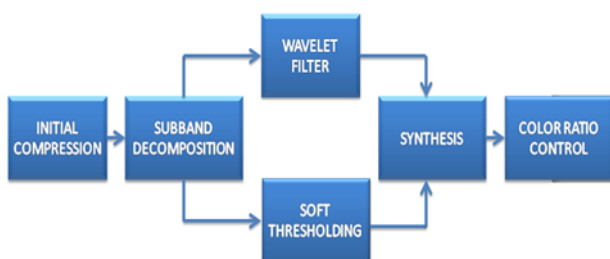


Figure 1. Block diagram of the proposed method

B. Denoising using a wavelet filter and soft-thresholding

In the proposed TM algorithm, decomposed subbands are filtered by using wavelet filter and soft thresholding method. In this work low frequency subbands are filtered by using wavelet filter and high frequency subbands noise can be reduced by using thresholding method. For the high frequency noise reduction method normal shrink wavelet thresholding method has been used. Various parameter can be used for the thresholding selection

$$T_N = \frac{\beta\sigma^2}{\hat{\sigma}_y} \tag{1}$$

Where, the scale parameter β^2 is computed once for each scale using the following equation:

$$\beta = \sqrt{\log\left(\frac{L_k}{J}\right)} \tag{2}$$

Where L_k is the length of the subband at k^{th} scale.



Figure 2. Output of the Normal shrink method

Various soft thresholding method can be used for the the noise reduction. In this proposed tone mapping method normal shrink method is used this method removes the noise greater than the SureShrink, BayesShrink and Wiener filtering most of the time.

C. Color Reproduction

In this proposed tone mapping method, Color values of the tone mapped image can be reproduced by using color saturation control parameter. For this color reproduction, s value set as low which provide natural scene. So that S vauve is limited to fixed maximum value of S_{max} . By using this color reproduction method artifacts can be suppressed.

$$s(X) = \min \left\{ S_{max}, \frac{a}{I_0(X)} \right\} \tag{3}$$

where 'a' is a scale constant, $0 \leq a \leq 1$. In this above equation S_{max} can be tuned to produce the tone-mapped color images with different saturation.

IV. RESULT AND DISCUSSION

Fig 3 shows HDR image(Gray scale image), is generated by combining LDR images, which are captured with varying exposure setting using auto exposure bracketing in a

digital camera which can contain noise. In above figure noise can be removed by using wavelet filter.

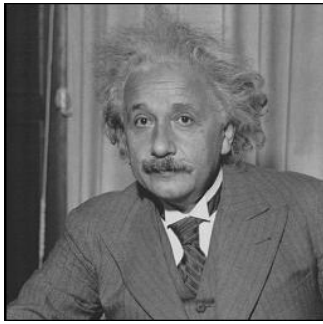


Figure 3. Input image (gray Scale)

Filtered image include low noise even as preserving area small print. Each pixel in the noisy image will probably be converted from its normal value by way of a method of (frequently) small amount. A histogram, a pot of the amount of distribution of a pixels worth of the photo against the frequency with it, happens, suggests a natural distribution of noise of the picture. Within the digital camera, if the sunshine which enter the lens misaligns with the sensors, it'll create image noise. Example for this tone mapping ways are gradient area high dynamic variety compression and a perceptual frame work for contrast reduction of excessive dynamic range snap shots.

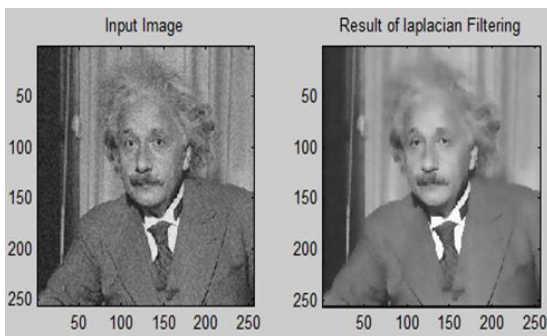


Figure 4. Image with & without noise

One other approach to tone mapping of high dynamic range portraits is complete by means of the anchoring thought of lightness belief. Chiu et al procedure presented the predicament of visibility loss by using making use of luminance scaling values where the dark and bright areas are not merged. This method can provide good performance on shaded portions of an image, but small bright feature in an image will create strong attenuation of the nearest pixels



Figure 5. Input Color Image

Filtered image contain low noise while preserving edge details. Each pixels in the image will be changed from its original value by a(usually) small amount. A histogram, a pot of the amount of distribution of a pixels value against the frequency with it noisy image, occurs, shows a normal distribution of noise. In the digital camera, if the light which enters the lens misaligns with the sensors, it will create image noise. Even if noise is not so visible in a image, some kind of image noise is bound to exist. Those noises can be removed in above Fig 5

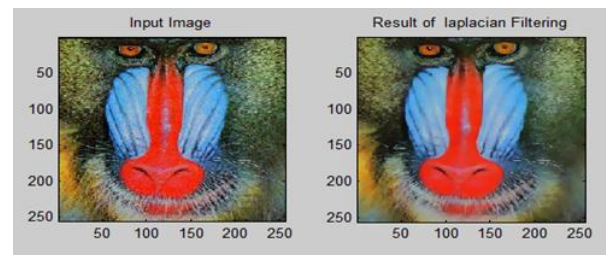


Figure 6. Image with & without noise(color)

In coarse grain noise (sparse light and dark disturbances), pixels in the noisy image are very different in color and intensity values of the image, unlike their surrounding pixels of the noisy image. Coarse grain noise can be caused by sharp and sudden disturbance in the image signal. Fig 6 shows removal of coarse grain noise in the image.

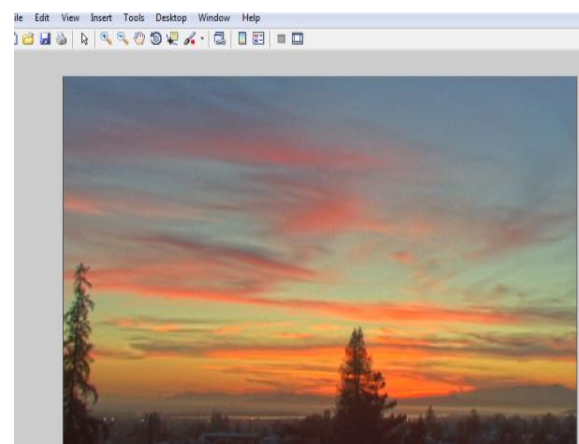


Figure 7. Limited dynamic range image

PARAMETER	VALUES
Mean Square Error	612.4863
Peak Signal to Noise Ratio	20.2598
MNormalized Cross-Correlation	1.0009
Average Difference	-0.6192
Structural Content	0.9496
Maximum Difference	103
Normalized Absolute Error	0.2061

V. CONCLUSION

In this work, discussed about improvement of reduction of noise in the tone mapped image. Furthermore, we compared the input image and output of the filtered image. The results obtained by using wavelet filter and thresholding can provide better quality of an image. This method can provide the good result for tone mapping method for converting high dynamic range into limited dynamic range. This filter used for preserving the detail in an image.

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