© 2018 IJSRST | Volume 4 | Issue 2 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X
Themed Section: Science and Technology

LIME: Low-Light Image Enhancement Via Illumination Map Estimation

K Ganga Bhavani[1], T. Durga Rao[2]
[1] Assistant Professor, JNTUA College of Engineering, Kalikiri, Andhra Pradesh, India
[2]Assistant Professor, JNTUA College of Engineering, Kalikiri, Andhra Pradesh, India

ABSTRACT

Enhancing the quality of low light Images is a critical problem .To overcome this problem efficient method introduced that is Low Light Image Enhancement Previously different algorithms used to enhance the quality of low light Images Among that one algorithm is multimedia algorithm .Through this algorithm we can process on only gray scale Images and the quality of Image is not properly enhance to that extent .The main drawback is that the quality of the image gets reduced because the processing can be done by considering the single pixel .In our method LIME first we are calculating the illumination map next gamma correction method used for denoising of the Image .After that block matching can be done using the method BM3D .Using this method processing can be done in RGB Images and also considering the neighboring pixels so that the quality of the Image gets enhanced and also the image gets denoised using non local means method and show its superiority over several state-of-the-arts in terms of Enhancement Quality and Efficiency .

Keywords : Illumination Estimation, Illumination (Light) Transmission, Low-light Image Enhancement

I. INTRODUCTION

Picture enhancement practice contain an amount of methods which seek out to improve this visible physical appearance of the impression so they can turn this impression to your form superior designed for evaluation by the human or unit. Picture enhancement indicates as the development of the impression physical appearance through growing dominance of several features or through reducing ambiguity in between unique regions of this impression. The intention of enhancement is usually to practice a picture so your consequence will be considerably better versus initial impression for a particular program. Picture enhancement is just about the most fascinating and also successfully pleasing parts of impression control. Picture enhancement can be a control in impression to make the idea appropriate for many applications. It is primarily employed to help the visible results plus the clarity in the impression, so they can produce an original impression much more approving with regard to computer to practice. The principal target of impression enhancement is usually to alter attributes of the impression to make the idea considerably better for a provided task as well as a particular observer. On this practice, a number of attributes in the impression are generally changed and also highly processed. The selection of attributes and also how they will be changed are generally particular to your provided task. Below observer-specific elements, such as human visible system such as human internal organs plus the observer's knowledge, can create this subjectivity for that selection that which impression enhancement process should be utilized.

Image enhancement is among the simplest and most appealing areas of digital image processing. Basically, the idea behind enhancement techniques is to bring out detail that is obscured, or simply to highlight certain features of interest in an image. A familiar example of enhancement is shown in Fig.1 in which when we increase the contrast of an image and filter it to remove the noise it looks better. It is important to keep in mind that enhancement is a very subjective area of image processing. Improvement in quality of these degraded images can be achieved by using application of enhancement Techniques.

In spatial domain techniques, we directly deal with all the image pixels. The pixel cost is manipulated to attain wanted enhancement. In frequency domain techniques, the image is first transferred straight into frequency domain. It means that, the Fourier Transform from the image is computed first. Every one of the enhancement operations are performed for the Fourier transform of the specific image and then the Reverse Fourier transform is performed to get the concomitant image.

II. RELATED WORK

Histogram Equalization

This method usually increases the global contrast of many images, especially when the usable data of the image is represented by close contrast values. Through this adjustment, the intensities can be better distributed on the histogram. This allows for areas of lower local contrast to gain a higher contrast. Histogram equalization accomplishes this by effectively spreading out the most frequent intensity values.

The method is useful in images with backgrounds and foregrounds that are both bright or both dark. In particular, the method can lead to better views of bone structure in x-ray images, and to better detail in photographs that are over or under-exposed. A key advantage of the method is that it is a fairly straightforward technique and an invertible operator. So in theory, if the histogram equalization function is known, then the original histogram can be recovered. The calculation is not computationallyintensive. A disadvantage of the method is that it is indiscriminate. It may increase the contrast of background noise, while decreasing the usable signal.

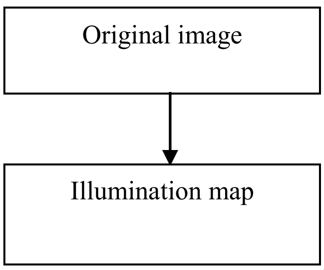
In scientific imaging where spatial correlation is more important than intensity of signal (such as separating DNA fragments of quantized length), the small signal to noise ratio usually hampers visual detection.

Histogram equalization often produces unrealistic effects in photographs; however it is very useful for scientific images like thermal, satellite or x-ray images, often the same class of images to which one would apply false-color. Also histogram equalization can produce undesirable effects (like visible image gradient) when applied to images with low color depth. For example, if applied to 8-bit image displayed with 8-bit gray-scale palette it will further reduce color depth (number of unique shades of gray) of the image. Histogram equalization will work the best when applied to images with much higher color depth than palette size, like continuous data or 16-bit gray-scale images.

Contextual and Variational Contrast Enhancement

Enhancement of the image done by using inter pixel of an image. The algorithm use 2-D histogram of input image that is created using association between the each pixel of input image and its neighboring pixel.The smooth 2-D intention histogram is obtained by optimize the sum of frobenius norms of difference between the input image histogram and evenly distributed histogram. By increase the dynamic range low contrasts are improved. High contrast also increased but not that much. This algorithm improves visual quality well but it required high computational time.

III. METHODOLOGY



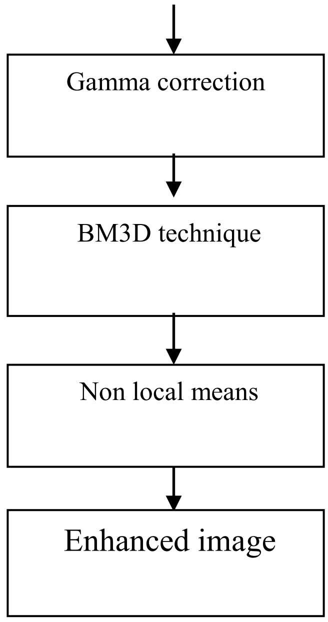


Figure 1. Flow For Proposed Method

The proposed method can processed in steps as follows

Input Image

Input(prompt) displays the prompt string on the screen, waits for input from the keyboard, evaluates any expressions in the input, and returns the result. To evaluate expressions, the input function can use variables in the current workspace

Illumination map

Global illumination, or indirect illumination, is a general name for a group of algorithms used in 3D computer graphics that are meant to add more realistic lighting to 3D scenes. Such algorithms take into account not only the light that comes directly from a light source (direct illumination), but also subsequent cases in which light rays from the same source are reflected by other surfaces in the scene, whether reflective or not (indirect illumination).

Theoretically, reflections, refractions, and shadows are all examples of global illumination, because when simulating them, one object affects the rendering of another (as opposed to an object being affected only by a direct light). In practice, however, only the simulation of diffuse inter-reflection or caustics is called global illumination.

Estimating illumination map

As one of the first color constancy methods, Max-RGB tries to estimate the illumination by seeking the maximum value of three color channels, say R, G and B. But this estimation can only boost the global illumination. In this paper, to handle non-uniform illuminations, we alternatively adopt the following initial estimation:

$$T(x) < -- \max_{c \in (R,G,B)} L^C(x)$$

for each individual pixel x. The principle behind the above operation is that the illumination is at least the maximal value of three channels at a certain location. The obtained T(x) guarantees that the recovery will not be saturated, because of

$$R(x) = {L(x)} \Big/ \left(\max_{L} L^c(x) + \in \right)$$

where ∈ is a very small constant to avoid the zero denominator. We point out that the goal of this work is to non-uniformly enhance the illumination of low-light images, instead of eliminating the color shift caused by light sources. As mentioned, another widely used model is based on the observation that inverted low-light images 1 - L look similar to haze images, which is thus expressed as

$$1 - L = (1 - R)oT + a(1 - \hat{T})$$

where a represents the global atmospheric light. Although the visual effect of inverted low-light images 1 - L is intuitively similar to haze images, compared to the model , the physical meaning of the above remains vague.

Gamma correction

Gamma correction can robotically enhance the image contrast. Gamma correction is a non-linear operation ,which is used to correcting lightness or darkness of image[4]. According to the gamma value only image brightness can be corrected. Gamma value ranging from 0.0 to 10.0. If gamma value less then

1.0(1.0), image gets lighten. Else gamma value equal to 1, no changes in an image. Gamma is apply only for display image not to the data of image. Within gamma correction three major process are done. First Histogram analysis, which provides the spatial information of an input image. In the second step, the weighting distribution is used to even the irregular occurrence and thus avoid generation of inauspicious artifacts. In the third and final step, gamma correction can robotically enhance the image.

It defines the association between a pixel's numerical value and its actual brightness. Study the intensity of the image. Based on the image intensity calculate the gamma value. Apply the gamma value on the original image to improve the brightness as well Preserve the brightness of the original image.

Gamma parameters calculate as:

$$\gamma = 1 - cdf\omega\, l$$

Block Matching 3d Method

The enhancement of the sparsity is achieved by grouping similar 2D fragments of the image into 3D data arrays which we call ìgroupsî. Collaborative ltering is a special procedure developed to deal with these 3D groups. It includes three successive steps: 3D transformation of a group, shrinkage of transform spectrum, and inverse 3D transformation. Thus, we obtain the 3D estimate of the group which consists of an array of jointly ltered 2D fragments. Due to the similarity between the grouped blocks, the transform can achieve a highly sparse representation of the true signal so that the noise can be well separated by shrinkage. In this way, the collaborative ltering reveals even the nest details shared by grouped fragments and at the same time it preserves the essential unique features of each individual fragment.

An image denoising algorithm based on this novel strategy is developed and described in detail. It generalizes and improves our preliminary algorithm introduced . A very efcient algorithm implementation offering effective complexity/performance trade-off is developed. Experimental results demonstrate that it achieves outstanding denoising performance in terms of both peak signal-to-noise ratio and subjective visual quality, superior to the current state-of-theart.

Non Local Means Technique

Non-local means is an algorithm in image processing for image denoising. Unlike "local mean" filters, which take the mean value of a group of pixels surrounding a target pixel to smooth the image, non-local means filtering takes a mean of all pixels in the image, weighted by how similar these pixels are to the target pixel. This results in much greater post-filtering clarity, and less loss of detail in the image compared with local mean algorithms.

If compared with other well-known denoising techniques, non-local means adds "method noise" (i.e. error in the denoising process) which looks more like white noise, which is desirable because it is typically less disturbing in the denoised product.Recently non-local means has been extended to other image processing applications such as deinterlacing and view interpolation.

IV. RESULTS

Figure 1. Input Image

Figure 2. Enhnaced Image

Figure 3. Input image

Figure 4. Enhnaced Image

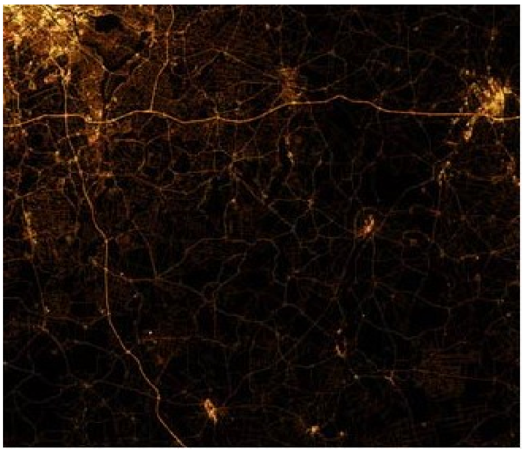


Figure 5. Input Image

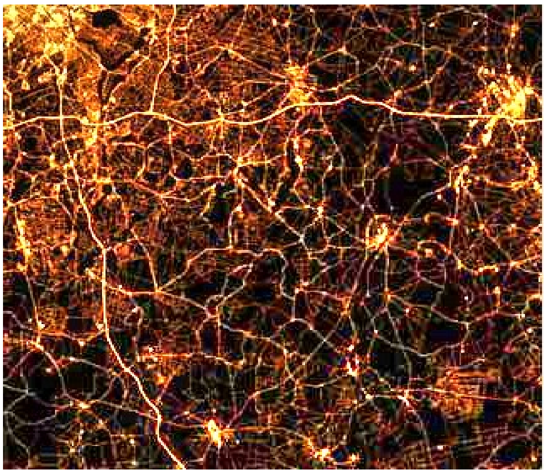


Figure 6. Enhanced Image

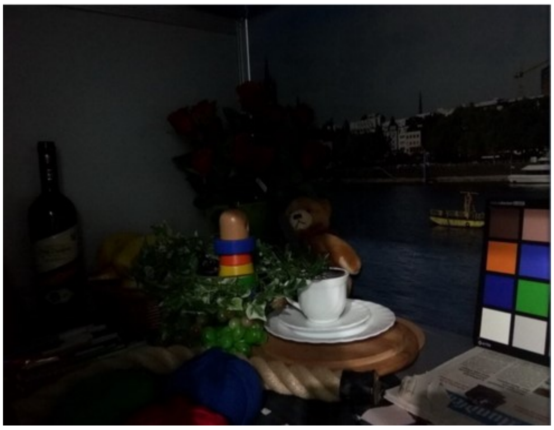


Figure 7 : Input Image

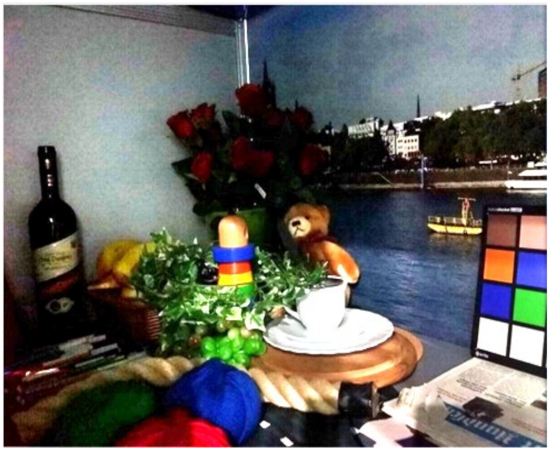


Figure 8. Enhnaced Image

V. CONCLUSION

In this paper, we have proposed an efficient and effective method to enhance low-light images. Here first estimating the illumination map and then BM3D and non local means is used to enhance the image. The experimental results have revealed the advance of our method compared with several state-of-the-art alternatives. It is positive that our low-light image enhancement technique can feed many vision-based applications, such as edge detection, feature matching, object recognition and tracking, with high visibility inputs, and thus improve their performance.

VI. REFERENCES

[1]. D. Oneata, J. Revaud, J. Verbeek, and C. Schmid, "Spatio"temporal object detection proposals," in ECCV, pp. 737–752, 2014.

[2]. K. Zhang, L. Zhang, and M. Yang, "Real"time compressive tracking," in ECCV, pp. 866–879, 2014.

[3]. E. Pisano, S. Zong, B. Hemminger, M. DeLuce, J. Maria, E. Johnston, K. Muller, P. Braeuning, and S. Pizer, "Contrast limited adaptive histogram equalization image processing to improve the detection of simulated spiculations in dense mammograms," Journal of Digital Imaging, vol. 11, no. 4, pp. 193–200, 1998.

[4]. H. Cheng and X. Shi, "A simple and effective histogram equalization approach to image enhancement," Digital Signal Processing, vol. 14, no. 2, pp. 158–170, 2004.

[5]. M. Abdullah"Al"Wadud, M. Kabir, M. Dewan, and O. Chae, "A dynamic histograme equalization for image contrast enhancement," IEEE Trans. on Consumer Electronics, vol. 53, no. 2, pp. 593–600, 2007.

[6]. T. Celik and T. Tjahjadi, "Contextual and variational contrast enhancement,"TIP, vol. 20, no. 12, pp. 3431–3441, 2011.

[7]. C. Lee and C. Kim, "Contrast enhancement based on layered difference representation," TIP, vol. 22, no. 12, pp. 5372–5384, 2013.

[8]. E. Land, "The retinex theory of color vision," Scientific American, vol. 237, no. 6, pp. 108–128, 1977.

[9]. D. Jobson, Z. Rahman, and G. Woodell, "Properties and performance of a center/surround retinex," TIP, vol. 6, no. 3, pp. 451–462, 1996.

[10]. D. Jobson, Z. Rahman, and G. Woodell, "A multi"scale retinex for bridging the gap between color images and the human observation of scenes," TIP, vol. 6, no. 7, pp. 965–976, 1997.

[11]. S. Wang, J. Zheng, H. Hu, and B. Li, "Naturalness preserved enhancement algorithm for non"uniform illumination images," TIP, vol. 22, no. 9, pp. 3538–3578, 2013.

[12]. X. Fu, D. Zeng, Y. Huang, Y. Liao, X. Ding, and J. Paisley, "A fusion"based enhancing method for weakly illuminated images," Signal Processing, vol. 129, pp. 82–96, 2016.

[13]. X. Fu, D. Zeng, Y. Huang, X. Zhang, and X. Ding, "A weighted variational model for simultaneous reflectance and illumination estimation," in CVPR, pp. 2782–2790, 2016.

[14]. X. Dong, G. Wang, Y. Pang, W. Li, J. Wen, W. Meng, and Y. Lu, "Fast efficient algorithm for enhancement of low lighting video," in ICME, pp. 1–6, 2011.

[15]. L. Li, R. Wang, W. Wang, and W. Gao, "A low"light image enhancement method for both denoising and contrast enlarging," in ICIP, pp. 3730– 3734, 2015.