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Intelligent Image Pair Fusion Scheme With Laplacian Terminologies

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ABSTRACT: The main motto of this system is to fuse the noisy and blurred image pair and show them into more accurate manner. Fusion: It is nothing but the Combination of Multiple things into single unit. In this layer based approach, a new method is proposed for decomposing the image pairs into two layers. That is the base layer and the detail layer, is considered for image pair fusion. In the case of infrared and noisy images, simple naive fusion leads to unsatisfactory results due to the discrepancies in brightness and image structures between the image pair. Cross Bilateral Filtering algorithm is used in this approach to propose a better result to fuse the image in more accurate manner. This proposed layer-based method can also be applied to fuse another noisy and blurred image pair.

KEYWORDS: Image Fusion, Pairing Approach, Multi-Image Scaling, Image Enhancement.

I.INTRODUCTION

In low lighting conditions, high camera gain or long exposure time can lead to noise or blurring artifacts on captured images, respectively. Even with state-of-the-art denoising and deblurring methods, high-quality image acquisition in low lighting conditions remains a challenging problem. To solve this issue, various types of image pairs that are captured twice consecutively for the same scene have been widely used. Noisy and blurred images, noisy and flash-produced images, and noisy and infrared images have been considered for the image pairs.

First, noisy and blurred image pairs can be acquired by controlling the amount of exposure; in other words, by using relatively short and long shutter speeds during shooting. In this way, an image captured with a short exposure will contain some noise but can avoid blurring artifacts, while an image captured with a long exposure will have blurring artifacts due to camera shake but will have clean color tones. Even though these two images are both degraded, the use of the image pair can improve the restored image quality via accurate kernel estimation (i.e., camera motion) and removal of ringing artifacts compared to the single-image-based deblurring and denoising methods. The second image pair consists of noisy and flashproduced images.

II.LITERATURE SURVEY

In the year of 2013, the authors "H. Yeganeh and Z. Wang" proposed a paper titled “”, in that they described such as: Tone-mapping operators (TMOs) that convert high dynamic range (HDR) to low dynamic range (LDR) images provide practically useful tools for the visualization of HDR images on standard LDR displays. Different TMOs create different tone-mapped images, and a natural question is which one has the best quality. Without an appropriate quality measure, different TMOs cannot be compared, and further improvement is directionless. Subjective rating may be a reliable evaluation method, but it is expensive and time consuming, and more importantly, is difficult to be embedded into optimization frameworks. Here we propose an objective quality assessment algorithm for tone-mapped images by combining: 1) a multiscale signal fidelity measure on the basis of a modified structural similarity index and 2) a naturalness measure on the basis of intensity statistics of natural images. Validations using independent subject-rated image databases show good correlations between subjective ranking score and the proposed tone-mapped image quality

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index (TMQI). Furthermore, we demonstrate the extended applications of TMQI using two examples - parameter tuning for TMOs and adaptive fusion of multiple tone-mapped images.

In the year of 2011, the authors "Z. Wang and Q. Li" proposed a paper titled “Information content weighting for perceptual image quality assessment", in that they described such as: Many state-of-the-art perceptual image quality assessment (IQA) algorithms share a common two-stage structure: local quality/distortion measurement followed by pooling. While significant progress has been made in measuring local image quality/distortion, the pooling stage is often done in ad-hoc ways, lacking theoretical principles and reliable computational models. This paper aims to test the hypothesis that when viewing natural images, the optimal perceptual weights for pooling should be proportional to local information content, which can be estimated in units of bit using advanced statistical models of natural images. Our extensive studies based upon six publicly-available subject-rated image databases concluded with three useful findings. First, information content weighting leads to consistent improvement in the performance of IQA algorithms. Second, surprisingly, with information content weighting, even the widely criticized peak signal-to-noise-ratio can be converted to a competitive perceptual quality measure when compared with state-of-the-art algorithms. Third, the best overall performance is achieved by combining information content weighting with multiscale structural similarity measures.

In the year of 2011, the authors "Z. Wang and A. C. Bovik" proposed a paper titled “Reduced and no-reference image quality assessment", in that they described such as: Recent years have witnessed dramatically increased interest and demand for accurate, easy-to-use, and practical image quality assessment (IQA) and video quality assessment (VQA) tools that can be used to evaluate, control, and improve the perceptual quality of multimedia content in a wide variety of practical multimedia signal acquisition, communication, and display systems. There is a vast and increasing proliferation of such content over both wireline and wireless networks. Think of the Internet: Youtube, Facebook, Google Video, Flickr and so on; networked high-definition television (HDTV), Internet Protocol TV (IPTV) and unicast home video-on-demand (Netflix and Hulu, for example); and an explosion of wireless video traffic that is expected to more than double every year over the next five years.

III.EXISTING APPROACHES – A SUMMARY

A novel contrast-based image fusion algorithm is used in the wavelet domain for noisy source images. Novel features of the fusion method are the noise reduction taking into consideration the linear dependency among the noisy source images and introducing an appropriate modification of the magnitude of the wavelet coefficients depending on the noise strength. Region based multi-focus image fusion method using local spatial frequency first segments the average image of source images to get the region map and then calculates local spatial frequency for each pixel in source images from a local window. After this, regional spatial frequency is calculated for each region. Then a fused image is constructed from the selected regions according to the RSF calculated. The past system approach has certain disadvantages, such as: (a) Past System introduces a problem of color artifacts that comes in the fused image formed and (b) Existing approach possesses some problems like blurring effects and noise in the fused image.

IV.PROPOSED SYSTEM

A flash is often utilized in low lighting conditions to add artificial light to the scene, thereby producing a sharp and noise-free image. However, the color tones of such image are different from those of the no-flash image captured under ambient light due to the color temperature difference between the ambient light and the flash. Thus, the color tones in a flash image need to be adjusted to be similar to those of the no-flash image via the color transferring method or illumination removal technique. The simple naive fusion method can also provide good results in such circumstances. The use of a flash has disadvantages in that its use is prohibited in some places, such as museums or churches, and it can generate unwanted red eye artifacts and can dazzle the eyes during shooting.

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Fig.1. Naive, multi-scale fusion and our single-scale result. Both involve, a similar degree of complexity, while our single-scale fusion method is able to deliver results competitive with the multi-scale approach.

As a result, near-infrared imaging, which can provide a visible color image and an infrared gray image, is being considered as an alternative. In normal photography, a hot mirror is used to eliminate the near-infrared part of the electromagnetic spectrum ranging from 750 nm to 1400 nm, to which CCD/CMOS sensors are sensitive. Thus, the exclusion of such a mirror leads to contamination on visible color images.

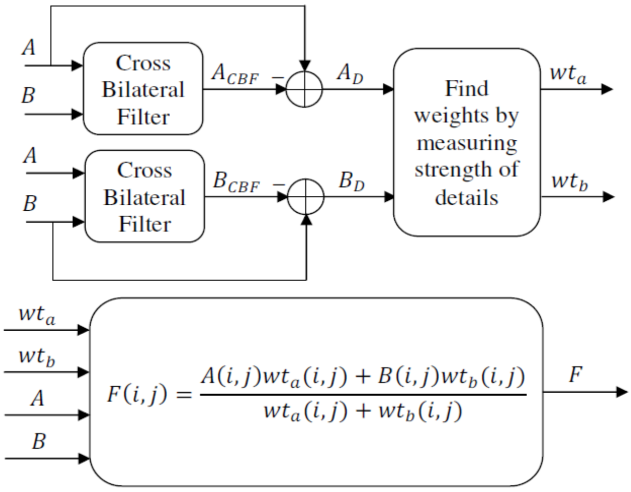

Fig.2. Proposed System Architecture

A.CROSS BILATERAL FILTER AND PIXEL BASED FUSION RULE

Bilateral filtering is a local, nonlinear and non-iterative technique which combines a classical low-pass filter with an edge-stopping function that attenuates the filter kernel when the intensity difference between pixels is large. As both gray level similarities and geometric closeness of the neighboring pixels are considered, the weights of the filter depend not only on Euclidian distance but also on the distance in gray/color space. The weights are computed using

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statistical properties of a neighborhood of detail coefficient instead of wavelet coefficient. A window of size w×w around a detail coefficient AD(i,j) or BD(i,j) is considered as a neighborhood to compute its weight.

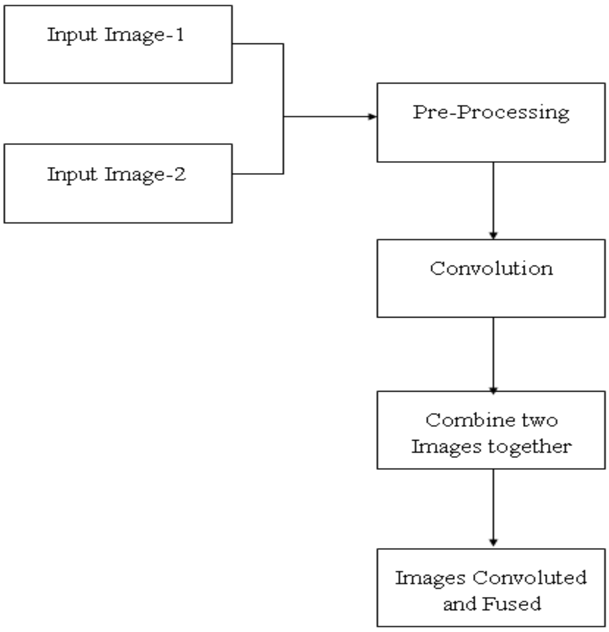

Fig.3. System Flow Diagram

B.MAJOR CONTRIBUTIONS

In this approach, a layer-based approach is proposed in order to avoid the discrepancy problem while fusing noisy and infrared images. Unlike the conventional residual approach, which is restricted to only noisy and blurred image pairs, the proposed layer-based approach can also be applied to noisy and infrared image pairs. Moreover, the proposed approach can remove ringing artifacts.

- In this system, a local contrast-preserving image conversion method is introduced in order to create a new base layer of the infrared image. This conversion method enables the appearance of the new base layer of the infrared image to be similar to that of another base layer, i.e., the denoised noisy image, so the discrepancy problem can be avoided during base layer fusion.
- A method for designing the detail layers of noisy and infrared images is provided in this paper. The detail layer of the noisy image is generated based on the difference between the noisy image and its denoised version. In contrast, the infrared image has two types of detail layers due to the newly created base layer. One is created using the difference between the infrared image and its denoised version, and the other is based on the difference between the new base layer and its sharpened version. This detail layer design method can not only effectively reduce the noise in the detail layer of the noisy image, but also amplifies the fine details in the detail layer of infrared images.
- The statistical properties of image patches, such as sparsity and non-local redundancy, have been widely used for image prior modeling. Patch sparsity refers to the representation of natural patches by the linear combination of the basis vectors and the corresponding coefficients. During this process, a constraint is imposed so that most of the coefficients are zero. Non-local patch redundancy indicates that there are often many repetitive patches throughout a natural image. However, the proposed method adopts the residual-based scheme, and thus the conventional intensity-based sparsity and redundancy prior models need to be changed to residual-based models. In other words, in this paper, residual-based sparsity and redundancy regularizations are introduced with the learned residual dictionary to estimate the original detail layer.
- An earlier study showed that two blurred images can improve the restoration quality compared to using only a single blurred image. Based on this result, an iterative scheme of updating the detail layer of the noisy image is adopted in the present paper in order to effectively suppress the noise in the detail layer of the noisy image.

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C.PROPOSED SYSTEM SUMMARY

The proposed image fusion algorithm directly fuses two source images of a same scene using weighted average. The proposed method differs from other weighted average methods in terms of weight computation and the domain of weighted average. Here, the weights are computed by measuring the strength of details in a detail image obtained by subtracting Cross Bilateral Filtering (CBF) output from original image. The weights thus computed are multiplied directly with the original source images followed by weight normalization. The proposed system approach has certain advantages, such as: (a) Better quality of information and less noise in the fused image formed, (b) Fast in speed which takes less memory and is easier to implement (c) It preserve edges of the fused image and (d) Remove the uneven illumination problem which occurs in fusion of images.

IV.EXPERIMENTAL RESULTS

The following figure shows the Image Input view of the proposed system.

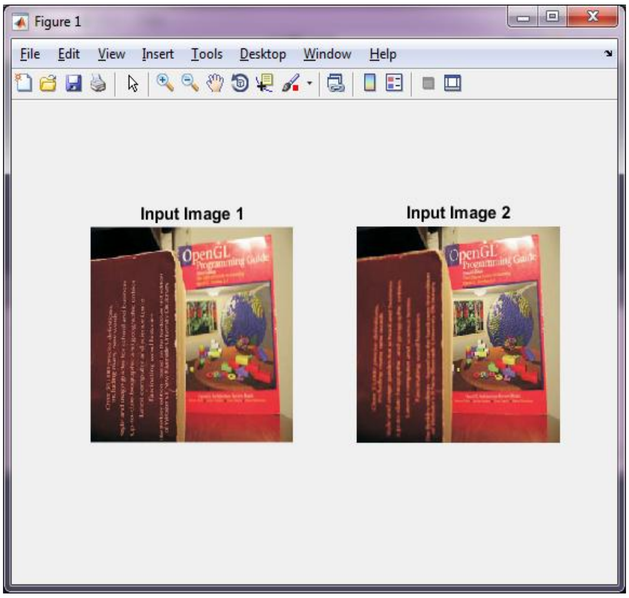

Fig.4 Image Input

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The following figure illustrates the fusion process of the image.

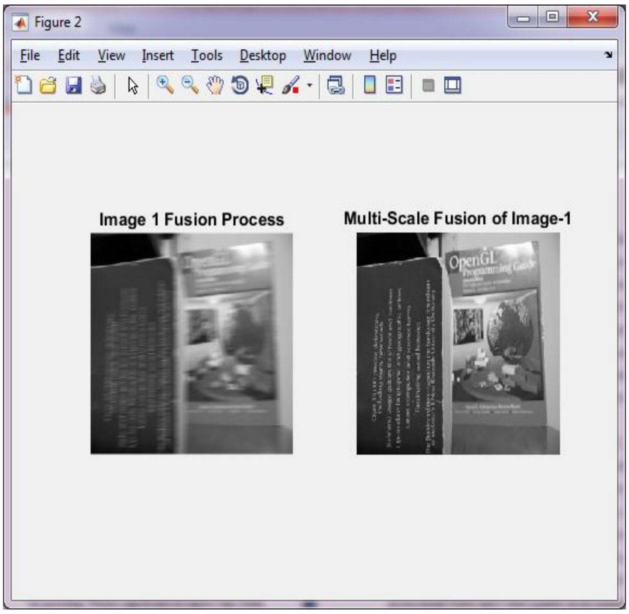

Fig.5 Image Fusion

The following figure illustrates the fusion and noise estimation scenario of the proposed system.

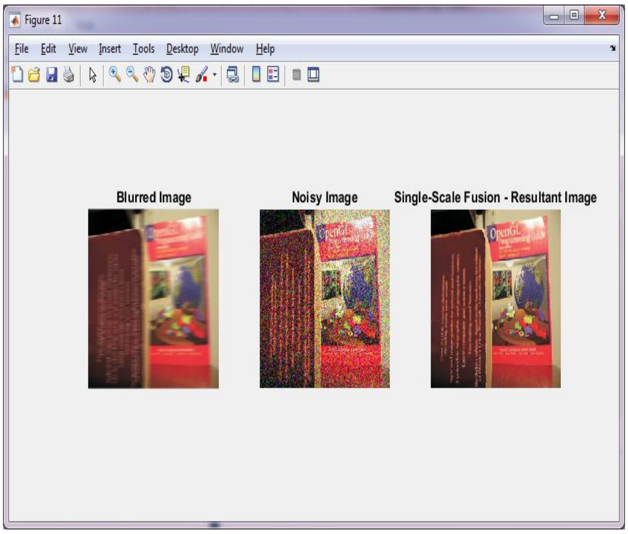

Fig.6 Fusion and Noise Estimation Scenario

V.CONCLUSION

A new layer-based image pair fusion method was proposed. To solve the discrepancy problem between noisy and infrared images, a local contrast-preserving conversion method was developed, thereby enabling the appearance of the base layer of the infrared image to be close to that of the noisy image. In addition, a new way of designing three types of detail layers that contain different information, e.g., highlights, edges, or textures, was introduced. This detail layer design leads to improvement in the edge and texture representations. Also, the proposed residual-based sparse

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coding effectively suppresses the noise in the detail layer of the noisy image through a feedback loop. Furthermore, the experimental results show that the proposed layer-based method can also be applied to noisy and blurred image pairs.

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