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"Review On An Improved Algorithm for Underwater Image Enhancement And Denoising"

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Abstract -For under water images, denoising and image enhancement is essential. Underwater exploration of the seafloor is used for various scientific reasons such as assessing the biological environment, exploring mineral, and for conducting underwater living organism's analysis. As the images underwater suffers from the different degree of distortion. Underwater images are affected by the light scattering and color change, so most of times images that we captured are blur. Due to light scattering incident light get reflected and deflected multiple times by particle present in the water which degrade the visibility and contrast of the underwater images. The underwater images have poor image quality. First it uses some preprocessing methodology which is to be done before wavelet threshold de-nosing. Then it will use webers law for image enhancement along with wavelet transform at the end we get some adaptive output and the image that we recovered is more enhanced as well as it reduce the noise level.

***Keywords*—Underwater images, Enhancement, Denoising, Wavelet transform Webers law.**

I. INTRODUCTION

The image denoising as well as image enhancement are still challenges. Recently proposed method are not that much suitable for enhanced and denoisy images. On the other hand due to the development of exploring the ocean by autonomous underwater vehicles & unmanned underwater images is major issue. Capturing clear image underwater is actually difficult task. In past years the sonar base has been widely used for detection and recognition of images under water. Many researches have adopted technique to restore or enhance underwater images. The recorded history of underwater exploration started in the year 1856 using manned submersibles with closed transparent window attached to the underwater vehicles. . The primary motivation to this was military. Now the study is conducted not only for the military, civilian use but also to satisfy the men's curiosity about deep sea world. Image processing contributed to underwater vision system during 90's.Recently, there are different algorithms in many computer languages incorporated with such vision system to give a clear view of the deep sea environment. Compared with sonar and acoustic imaging, even though they can be used in high range applications, optical imaging camera can provide high resolution images at low cost. Underwater images have lot of degradations while comparing to the natural photographs .These degradations have lots of dependencies in the depth of water column, under water ecology and artificial. light that are used to illuminate the scene.

In the water level surface the sunlight will spread and get absorbed non-uniformly. As we go to depth of several hundred meters, the low wavelength of natural light will be absorbed by water and only blue or green will be visible..

The proposed work is used for enhancing and characterization of the underwater images is by wavelet transform and webers law. Most algorithms or technic have not attained desired level of image denoising and image enhancement. Depending on the assumption of algorithm all shows outstanding performance but fails in general which removes the image fine structure. The wavelet gives a superior performance in image denoising due to its properties such as scarcity and multiresolution structure. This methodology will focused on the enhancement algorithm that uses signal underwater optical images. Very first proposed work will apply some preprocessing methodology for noisy and blur images. In order to remove the denoising of the image it will use wavelet transform and for image enhancement it will make the use of webers law. The decomposition of signal makes full use of high frequency information of each of the multidimensional can add image details and get a better enhanced and denoisy image.

The light propagation in the water is caused due to absorption and scattering. The light in water can influence the overall performance of underwater imaging system. Blurring of the image is caused due to the forward scattering and the contrast of the images is caused due to the back scattering. The scattering of the light in water causes uneven illumination, low contrast and poor quality of the image. All these problems can be overcome by applying wavelet transform method to image de-noising. It is important to select threshold and the output of the threshold function when using wavelet threshold for image de-nosing. However, the traditional selection fixed threshold method is not reasonable. Considering the problems, the paper puts forward the method that combining adaptive threshold selection with adaptive output of the threshold function. The proposed method overcomes the

limitations of traditional threshold selection and increases the peak signal to noise ratio (PSNR) of the image and obtain better de-noising effect.

LITERATURE REVIEW

Image de-noising is done by LeiFei Wang Yingying[1] apply wavelet transform method .In which it is important to select threshold and the output of the threshold function when using wavelet threshold for image de-nosing. However, the traditional selection fixed threshold method is not reasonable. Considering the problems, the paper puts forward the method that combining adaptive threshold selection with adaptive output of the threshold function. The method overcomes the limitations of traditional threshold selection and increases the peak signal to noise ratio (PSNR) of the image and obtain better de-noising effect.

Some preprocessing methodology proposed by Varinderjit kaur, Arpinder Singh and Ajay Kumar Dogra[2] on defining a general mathematical and experimental methodology to compare and classify classical image denoising algorithms and, second, to propose a nonlocal means (NL-means) algorithm addressing the preservation of structure in a digital image. The mathematical analysis is based on the analysis of the "method noise," defined as the difference between a digital image and its denoised version. Algorithm is presented by John Y. Chiang and Ying-Ching Chen.[3] based on the WCID which helps in effectively restoring image color balance and remove haze. As per the researches, no existing techniques can handle light scattering and color change distortions suffered by underwater images simultaneously. The experimental results demonstrate superior haze removing and color balancing capabilities.

Underwater image pre-processing is absolutely necessary due to the quality of images captured under water. Basically, under water images suffer from quality degradation due to retransmission of limited range of light, low contrast and blurred image due to quality of light and diminishing color. When an underwater image is captured, pre-processing is necessarily done to correct and adjust the image for further study and processing. Dr.G.Padmavathi, Dr.P.Subashini, Mr.M.Muthu Kumar and Suresh Kumar Thakur[4] worked on Different filtering techniques .The filters used normally improve the image quality, suppress the noise, preserves the edges in an image, enhance and smoothen the image. Therefore an attempt has been made to compare and evaluate the performance of three famous filters namely, homomorphic filter, anisotropic diffusion and wavelet denoising by average filter used for under water image pre-processing. Out of the three filters, wavelet denoising by average filter gives desirable results in terms of Mean Square Error and Peak Signal to Noise Ratio (PSNR). However the elapsed time of the three filters is also studied to identify the suitable filters that process the image quickly by preserving the image quality.

Image enhancement done by Mukesh C. Motwan, Mukesh C. Gadiya , Rakhi C. Motwani[5] described different methodologys for noise reduction (or denoising) giving an insight as to which algorithm should be used to find the most reliable estimate of the original image data given its degraded version. As Image denoising still remains a challenge for researchers because noise removal introduces artifacts and causes blurring of the images. Noise modeling in images is greatly affected by capturing instruments, data transmission media, image quantization and discrete sources of radiation. Different algorithms are used depending on the noise model. Most of the natural images are assumed to have additive random noise which is modeled as a Gaussian. Speckle noise is observed in ultrasound images whereas Rician noise affects MRI images. The scope is to focus on noise removal techniques for natural images.

PROPOSED WORK

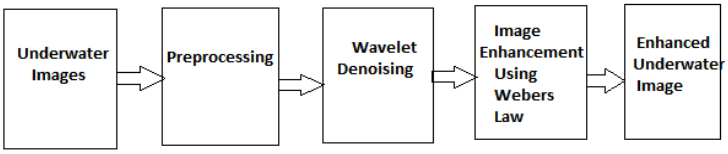

Figure (a) Proposed Work for Underwater Image Enhancement

Here proposed work uses some prepossessing methodology which is shown in figure(a).For restoring image from denoising it use wavelet transform and for getting more enhanced Image it make the use of law called webers law.Here it will use MATLAB as simulation experiment tool.

Underwater Images- Firstly we will use constructed underwater images.Then we will apply some preprocessing methodologies.

Preprocessing- For getting better denoising image some preprocessing should be done before wavelet threshold denoising.The preprocessing is done by two ways.Very first we will use Homomorphic filtering techonology to eliminate the non-uniform illumination and balance constrast.In the second case we will apply the Gaussian low pass filtering for smoothing the image.

The following reasons specify why the preprocessing is necessary for underwater images.

i. Underwater image degradation is due to specific transmission properties of light in the water like absorption and scattering.
ii. Specificity of environment like light changing, water turbidness, and blue hue is more or less predominant when vehicles move.

iii. Specificity of video captures like unknown rigid scene and unknown color or low light sensitivity due to Marine snow.

The preprocessing is required for underwater images due to poor capture image quality.

Wavelet Transform-As proposed work uses Wavelet transforms which represent signals with a high degree of sparsity. This is the principle behind a non-linear wavelet based signal estimation technique known as wavelet denoising. In this paper we explore wavelet denoising of images. In this, a method to enhance contrast is proposed; the methodology consists in solving an optimization problem that maximizes the average local contrast of an image. The optimization formulation includes a perceptual constraint derived directly from human threshold contrast sensitivity function.

Webers Law- Morphology is a technique of image processing based on shape and form of objects and it works on webers law. Morphological methods apply a structuring element to an input image, creating an output image at the same size. The value of each pixel in the input image is based on a comparison of the corresponding pixel in the input image with its neighbors. By choosing the size and shape of the neighbor, you can construct a morphological operation that is sensitive to specific shapes in the input image.

Enhanced Image- At the end we get enhanced image by the morphological operations that can first be defined on gray scale images where the source image is planar (single-channel). The definition can then be expanded to full-colour images.

As discussed, there are some issues concerning image processing analysis particularly in the context of underwater image enhancement. It has been highlighted that researchers within the field of marine research in general and computer science in particular are facing problems regarding the quality of the underwater images. Such problems need to be addressed in order to perform an effective and rigorous analysis on the underwater images. Most importantly, the problems need to be addressed in the pre-processing stage in the computer vision system. Given the theoretical and technological perception to marine research, the problem of image enhancement is gaining increasingly importance. One of the most significant issues is how to improve the quality of the underwater images in order to streamline the image processing analysis. The problems related to underwater images come from the light absorption and scattering effects by the marine environment. In order to eliminate this problem, researchers are using state-of-the-art technology such as autonomous underwater vehicles , sensors and optical cameras , visually guided swimming robot. However, the technology has not yet reached to the appropriate level of success. For example, the movement of autonomous underwater vehicles generates shadows in the scene while the optical camera provides limited visibility when it is used to capture underwater images. It has its own merits and demerits. In order to overcome the limitations of technology, some researchers annotate images manually. However this process is labour intensive and it also requires significant agreement amongst the annotators. In order to address the issues discussed above, we propose an approach on webers law and wavelet transform.

CONCLUSION

The proposed work will effectively restore the image from denoising as well as it will gives more enhanced image. The proposed algorithm combining adaptive threshold with adaptive output of the threshold function not only remove noise, improve the PSNR, but also get a better visual effect. By applying the proposed approach, we can produce promising results. Future work will include further evaluation of the proposed approach.

REFERENCES

[1] LeiFei Wang Yingying "The Research of Underwater Image De-noising Method Based on
Adaptive Wavelet Transform" IEEE 2014.
[2] Varinderjit kaur, Arpinder Singh and Ajay Kumar Dogra.'' A Review on Underwater image
enhancement". International Journal of Advanced Research in computer and Communication
Engineering Vol. 3, Issue 7 July2014.
[3] John Y. Chiang and Ying-Ching Chen."Underwater Image Enhancement by Wavelength
Compensation and Dehazing",1756 IEEE TRANSACTIONS ON IMAGE PROCESSING,
VOL. 21, NO. 4, APRIL 2012 .
[4] Dr.G.Padmavathi, Dr.P.Subashini, Mr.M.Muthu Kuma r and Suresh Kumar Thakur
"Comparison of Filters used for Underwater Image Pre-Processing" IJCSNS International
Journal of Computer Science and Network Security, VOL.10 No.1, January 2010 .
[5] Mukesh C. Motwan, Mukesh C. Gadiya , Rakhi C. Motwani "Survey of Image Denoising
Techniques".2010
[6] Huimin Lu,Yujie Li,Lifeng Zhang,Akira Yamawaki,Shiyuan Yang,Seiichi Serikawa
"Underwater Optical Image Dehazing Using Guided Trigonometric Bilateral Filtering"
[7] James S.Walker Wavelet-based Image Compression Sub-chapter of CRC Press book:
Transforms and data compression.
[8] White, E.M., Partridge, U.C., Church, S.C, "Ultraviolet dermal reflection and mate choice in
the guppy", In 2003, pp. 693-700.
[9]Naveen Venugopal,A.Jothilingam,M.S.Sudhakar, R.Ramesh ,P.Karthikeyan." Underwater
image Enhancement and Edge Detection" international Journal of Image Processing and
pattern Recognition Vol. 1: Issue 1.
[10] Stewart E. Harris,Robert D. Ballard,ARGO: Capabilities For Deep Ocean Exploration,IEEE.
[11] Kashif Iqbal, Rosalina Abdul Salam, Azam Osman and Abdullah Zawawi Talib
"Underwater Image Enhancement Using an Integrated Colour Model " 2007.

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