ENHANCEMENT OF UNDER WATER IMAGE USING GAN

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ABSTRACT:
Underwater image enhancement has received much awareness in underwater vision research. However, raw underwater images easily suffer from color distortion, exposure, and fuzz caused by the underwater scene. The focus has been on open-imagery and much less on underwater visual data. Intrinsic underwater distortions, such as color loss poor contrast, and under-exposure, caused by attenuation of light, refraction, and scattering, greatly affect the visual quality of underwater data, such as existing open-air trackers executing less efficiently on such data. To help bridge this gap, this article proposes a GAN generative advers arial network) to facilitate the development of tracking algorithms well-suited for underwater environments. Our test results demonstrate the short comings of living tracking algorithms on underwater data and how our generative adversarial network (GAN)-based enhancement model can be used to improve tracking performance. We also evaluate the visual quality of our model's output against existing GAN-based methods using well-accepted quality, metrics and exhibit that our model yields better visual data. Underwater object tracking is pivotal in applications, such as underwater search and rescue operations home land and maritime security, deep ocean exploration, underwater robot navigation, and sea life monitoring.

Keywords— Image processing, MATLAB, GAN, Histogram, Greyscale, Sharpening, RGB, Indexed.

INTRODUCTION

Before we jump into image processing, we need to first understand what exactly is an image. Is it a visual representation of any person or a thing. The analysis and manipulation of a digitized image especially to improve its quality. It is a method that we use to perform an image to get an enhanced image and extract some useful information from it. +Image processing is somewhat like signal processing in which the input is an image and the output will be the image or the characteristics/features of the image.

The procedure of upgrading the quality and information content of original data before processing. The quality of the underwater image is poor due to the impurities in the water. The properties of water cause the observation of sunlight which travels through the water medium, resulting in low contrast, blur, in homogeneous lighting, and color diminishing of the underwater images.

The implementation techniques of image processing have a massive impact on many tech organizations. Some of them are, the desired format of any digital image is available, Improvement in images for human interpretation, form a chine interpretation, information can be easily processed

and extracted,the range of image pixels can be manipulated to any desired density and contrast, Storing and retrieving images is very simple.

Image processing with MATLAB is a three-step operation in which you load, manipulate, and display results as output.While this may sound simple enough, many of the images you work with require accurate manipulation to get accurate results, and the process, as well as the specialized image processing tools MATLAB provides, reflect this requirement. Once processing is done, you can do tasks such as statistical analysis, feature extraction, and property measurement with greater assurance that your results will be correct.

LITERATURE REVIEW

"MLFcGAN Multilevel Feature Fusion-Based Conditional GAN" for Underwater Image Color Correction in Xiaodong Liu, Zhi Gao, Ben M, Chen 2019[1]. In this letter, they proposed a generic MLFcGAN under the framework of conditional GAN for underwater image color correction. Extensive experimental results show that by embedding high-level information with low-level knowledge at different scales, MLFcGAN possesses better learning ability. But, in our project, we used a GAN(generative adversarial network) not only to enhance a particular section of an image but also an entire underwater image.

Underwater image enhancement using guided trigonometric bilateral filter and fast automatic color Huimin Lu, Yujie Li, Seiichi Serikawa Department of Electrical Engineering and Electronics, Kyushu Institute of Technology, Japan-2013[2]. In this paper, they explored and successfully implemented novel image enhancement techniques for under water optical images processing the difference in attenuation among the red color channel, this method also contains some problems such as the influence of the possible presence of an artificial lighting source is not considering the quality assessment may be unsuitable for underwater image measurement. So, in our project, we restored the blurry and noisy images with high-quality image restoration.

Multi-scale adversarial network for underwater image restoration Jingyu Lu, Na Li, ShaoyongZhang, Zhibin Yu, Haiyong Zheng, Bing Zheng No. 238, Songling Road, Ocean University of China,Qingdao, Shandong, China-2018[3]. In this paper, they present a muddy underwater image restoration method called M-Cycle GAN. This network is a completely unpaired advers arial system. In this experiment, we found that the model cannot generate a plausible image under homogeneous illumination. But in our project, we magnified the underwater image better with fewer methods.

Edge-Enhanced GAN for Remote Sensing Image Super-resolution. Kui Jiang, ZhongyuanWang,Member,IEEE,PengYi,GuangchengWang,TaoLu,andJunjunJiang,Member,IEEE2019[4].The comparative advantages remain unsatisfactory in recovering the high-frequency edge details of theimagesinnoise-contaminated imaging conditions, the SR reconstruction that learns fine image textures and detailed edges simultaneously. so, in this paper, the particular edges of an image are considered and enhanced and noise in the image is removed by using GAN.

Low-light Image Enhancement Based on Joint Generative Adversarial Network and ImageQuality Assessment Wei Hua College of Mathematics and Computer Science, Fuzhou University,Fuzhou, China Youshen Xia College of Mathematics and Computer Science, Fuzhou University,Fuzhou, China.2018[5]. In this work, we have presented a novel deep-learning method for low-lightimage enhancement images captured in low-light conditions that are often disturbed by low light, blur,and

noise. Max of the conventional image enhancement methods is less robust without considering the effectiveness of the blur and noise. so, in this project, the low contrast image is only enhanced not the entire image.

Coupled GAN with Relativistic Discriminators for Infrared and Visible Images Fusion QileiLi,Student Member, IEEE, Lu Lu, Member, IEEE, Zhen Li, Student Member, IEEE, Wei Wu, Zheng Liu,SeniorMember,IEEE,Gwanggil Jeon, Member, IEEE, and XiaominYang, Member, IEEE, 2019[6].

In this paper, an efficient infrared and visible image fusion method named RCGAN has been proposed. The RCGAN exploited the coupled GAN structure to achieve a complete fusion operation. the project is based on infrared and visible images and enhances the specifically visible sector of an infrared image.

METHODOLOGY

In this project, we are going to enhance the underwater image. The underwater image isenhanced by using the Gan technology. The Gan is widely used in underwater image enhancement missions because it can finish image-style conversions with high efficiency and high quality.

The Gan is composed of two neutral networks a generative network and a discriminator network. The generator in Gan is a neural network that creates data that is to be trained on the discriminator. To enhance the original image, at the generator block, we used several techniques which are greyscale sharpening, RGB, indexed, andso on.

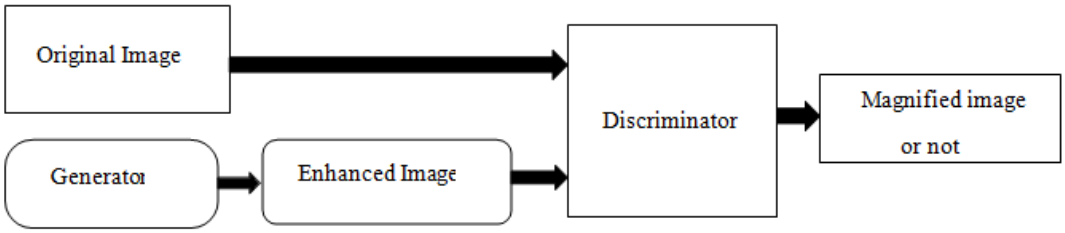

Fig:1 Gan Architecture

The original image is converted into a grayscale image which helps in clarifying algorithms and as well as eliminates the complexities related to computational requirements.Then, the grayscale image will be sharpened so that it improves its highlights edges, and fine details in an image.

Sharpening filters makes the conversion between features more recognizable than smooth and blurry images. In the index images for pixel values, we use straight mapping to color map values.

Each image pixel has a color that determines the usage of corresponding values as an index in the map. Then, the indexed image is converted into an RGB image so that we can watch multi-channel images. By restoring image edges and intricate details to make images sharper and more detailed.

The colors are designed to reflect genuine colors. Then the image will be converted into an indexed image for direct mapping of pixel values to color map values.

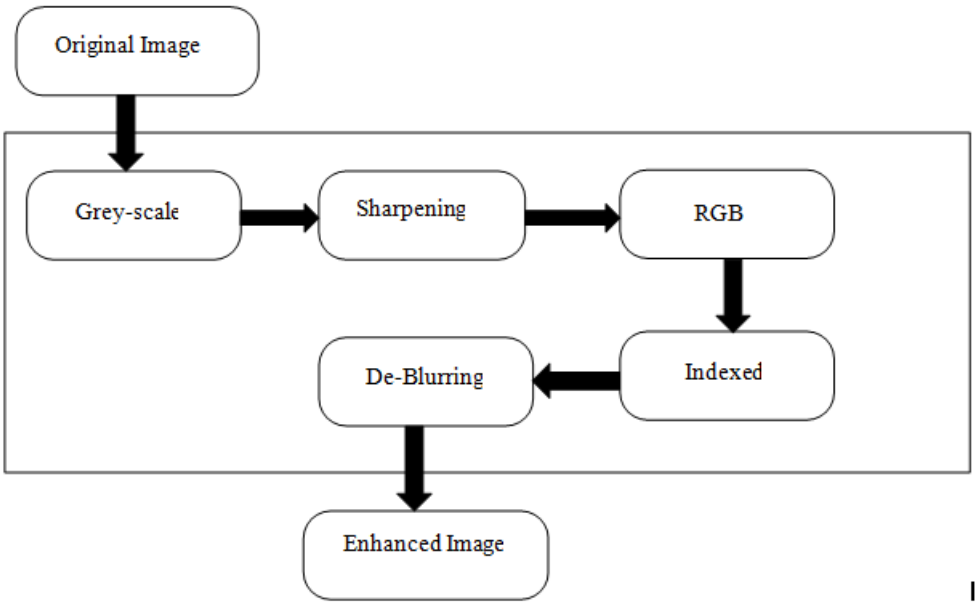

Fig-2.Generator Block

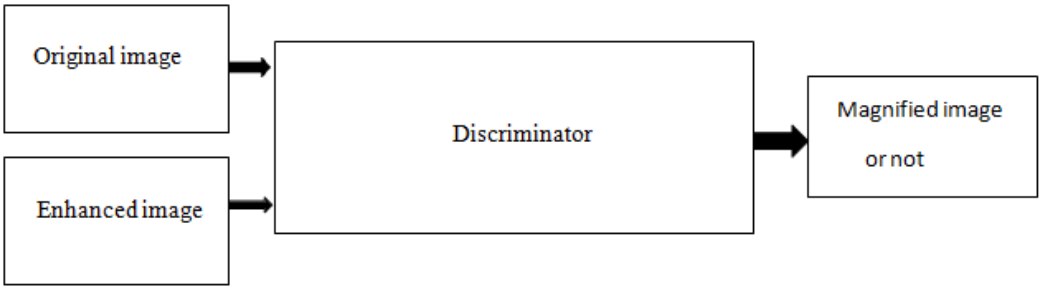

Fig-3.Discriminator Block

To get the desired output image, we need to follow these steps, First and foremost, open the MATLAB application on a desktop and insert the dataset of the underwater blurred images into it. At the initial stage of the code reading and showing the dataset, the image pops up on the output window as the "original image.

“At the generator part, the "original image" is given to the further stage of the code by using many functions and methods, and the outcome of the next stage will become the input for the next stage. This process continues until we get the "enhanced image" from the "original image" and the problems in the original image are solved at the end of the generator code.

Later, the enhanced and original images are given as the input for the discriminator part that compares the original image and enhanced image and gives a histogram graphical representation for both original and enhanced images respectively.

RESULTS

From the given input image, at the generator part by using several methods the enhanced image of the original image is obtained. At the end of the discriminator part, the (histogram) graphical representation of the enhanced and original images is acquired. so, By observing we can say that the histogram graphs the problems in the original image like a blur,noise,low contrast,etc are reduced in a magnified image.

Fig-4.Original Input Image

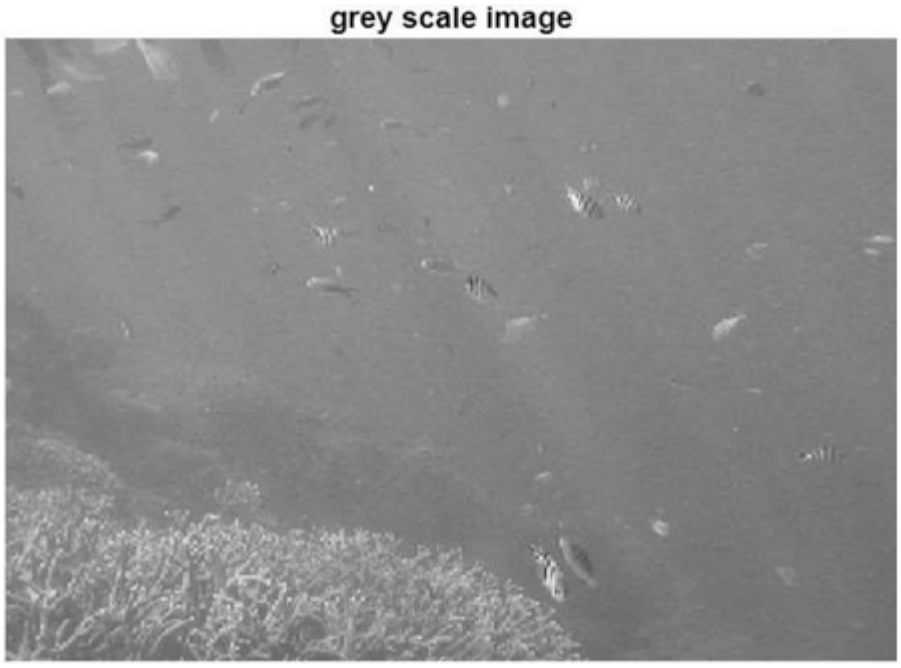

Fig-5.Grey-Scale Image

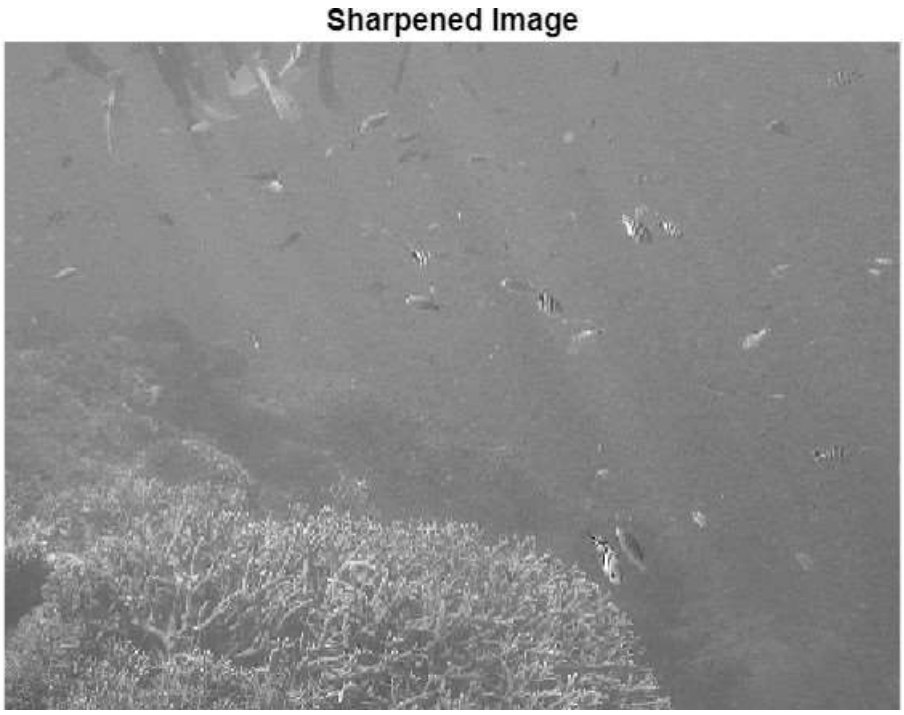

Fig-6.Sharpened Image

Fig-7.RGB Image

Fig-8.Indexed Image

Fig-9.De-Blurred (Enhanced) Image

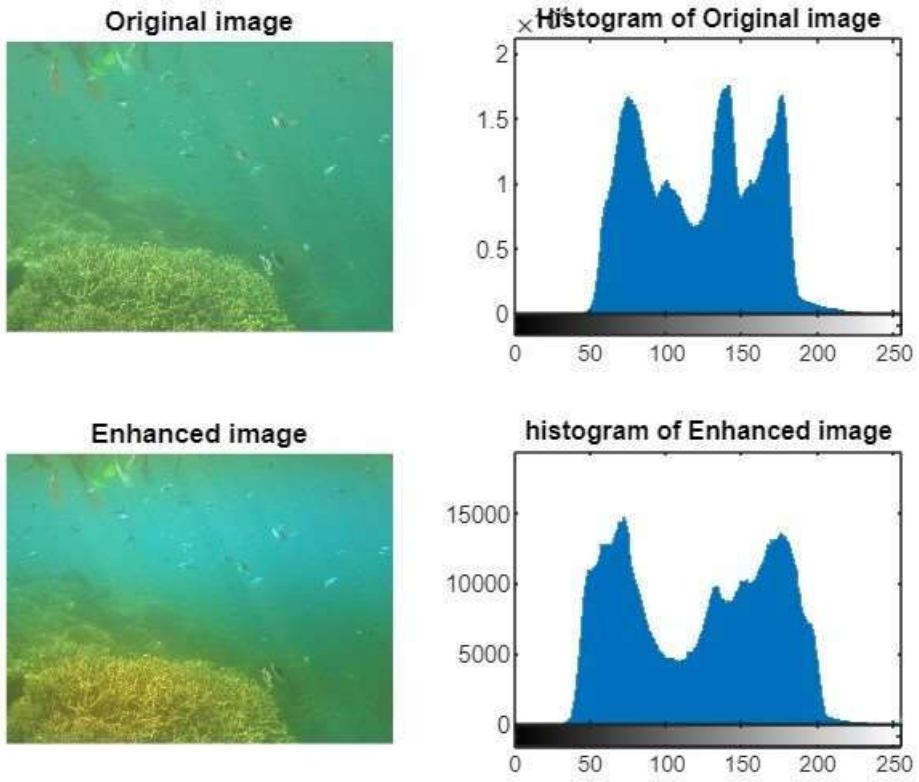

Fig-10.Histogram (Discriminator) Output Image

CONCLUSION

The issue connected with getting the visibility of objects at a long or short distance in underwater scenes gives problems to the image processing community. In this article, we have studied some of them to bring the intention of bringing the information together for better comprehension and comparison of the methods.

We have outlined the available methods for image restoration and image enhancement, concentrating on the conditions for which each of the algorithms has been originally illuminated. We have also analyzed the methodology used to estimate the algorithms' performance, highlighting the works where a quantitative quality metric has been used. Nowadays, leading advancements in optical imaging technology and the use of sophisticated sensing techniques are promptly increasing the ability to image objects in the sea.

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