Review on Enhance Underwater Images by Reducing Haziness

Asif Ahmad Andrabi[1], Prof. Sunil K Panjeta[2]
[12]*ECE, Yamuna Institute of Engg. and Tech., Yamunanagar, INDIA*

Abstract- Underwater vision is one of the research area of investigation for researchers. Autonomous Underwater Vehicles (AUV) and Remotely Operated Vehicles (ROV) are normally engaged to confine the data such as underwater mines, shipwrecks, coral reefs, pipelines and telecommunication cables from the underwater environment. Underwater images are basically specify by their poor visibility because light is exponentially diminish as it travels in the water, and the scenes result poorly contrasted and hazy. Light attenuation limits the visibility distance at about twenty meters in clear water and five meters or less in turbid water. The light reduction process is caused by absorption and scattering, which impact the whole performance of underwater imaging systems.

Keywords- underwater, optimization, haziness, blurness

I. INTRODUCTION

Underwater imaging is demanding due to the physical properties obtainable in such environments. Distinct from common images, underwater images suffer from poor visibility because of the attenuation of the propagated light. The light is diminished exponentially with the distance and depth mainly because of absorption and scattering effects. The absorption significantly minimize the light energy although the spreading causes changes in the light direction. The random reduction of the light is the main cause of the foggy emergence although the fraction of the light scattered back from the medium along the sight noticeably reduce the scene contrast. These properties of the underwater medium yields scenes identify by poor contrast where distant objects emerge misty. Basically, in common sea water, the objects at a distance of more than 10 meters are almost identical although the colors are faded because their feature wavelengths are cut according to the water depth.

In order to deal with underwater image processing, they have to think first of all the fundamental physics of the light dissemination in the water medium. Physical properties of the medium cause deprivation effects not present in normal images taken in air. Underwater images are fundamentally specify by their poor visibility because light is exponentially reduced as it travels in the water and the scenes outcome poorly contrasted and hazy. Light diminish limits the visibility distance at about twenty meters in clear water and five meters or less in turbid water. The light reduced process is caused by absorption (which removes light energy) and scattering (which changes the direction of light path).

The physical properties of an underwater medium put off the deprivation of normal images taken in the air. As light travels in water, light intensity is exponentially lost build upon the wavelength of the color spectrum. The reduction of light limits the visibility distance to approximately 20 m in clear water and to 5 m or less in turbid water. Light that travels in air is partially reflected back upon entering water; the direction and effect vary based on the systemof the water surface. Moreover, water

motion generates waves that diffuse the light entering the water to establish crinkle paradigm. Light.

II. RELATED WORK

Ancuti, Codruta O., et al. [2018] in this paper, the author proposed color balance and fusion for under water image enhancement. This method is proposed on single image and not required any additional hardware. In this associate weight maps are used to transfer the edges and color contrast to output image. Artifacts are created in low frequency component of reconstructed images. This method improves the global contrast, edges sharpness and reduced dark regions.

Huang, Dongmei, et al. [2018] in this paper, the author proposed relative global histogram stretching for water image enhancement approach. This approach consists of two parts that are color correction and contrast correction. In contrast correction method RGB color space is used and redistributes each RGB channel histogram. These dynamic parameters are related to intensity distribution of original image and wavelength attenuation of different color underwater. To reduce the noise from the image bi-lateral filtering is used and enhances the local information of shallow water image.

Li, Chongyi, et al. [2018] under water image enhancement is done by image color correction method which is based on weakly supervised color transfer. This approach solved the problem of color distortion. In this approach multi-term loss function is used for measure adversial loss, similarity index measure loss, and cycle consistency loss. The results of the proposed approach are better in image enhancement and it improves the performance of vision tasks.

Hu, Haofeng, et al. [2018] underwater images are degraded by scattering of light and noise in the water. In this work polarization information is used which has efficiency to improve the quality of image in scattering medium. Non-uniform optical field image recovery method is proposed in this paper. This method enhance the quality of image and gives better performance from existing method.

Lu, Huimin, et al. [2018] The approach proposed in this paper is used to solve the problem of underwater depth map estimation problems that are occurring in low intensity of light. This problem is solved by using deep neural network by depth estimation. The results of the proposed approach outperforms and effective.

Zhang, Shu, et al. [2017] Underwater image enhancement is attractive research area due to the degradation occurred by scattering and absorption of light. In this paper, the author proposed Retinex method which is a combination from retina and cortex. This method uses bi-lateratel and tri-lateral filters for the images. Performance evaluation of the proposed method is done by comparing with existing method.

Chang, Cheng-Hao, et al. [2017] in this paper, the author design and implement a low-cost guided image filter for underwater image enhancement. This method is based on TSMC and CMOS technology and operates on high power to support full HD image enhancement. It provides high throughput and effective frame rate.

Emberton, et al. [2017] underwater image and video dehazing is done by using Haze region segmentation approach. It improves the visibility in images and videos by detecting and segmenting image regions. Illuminant elimination is done by using white balancing approach. This method reduces the color cast and enhances the image contrast. The computation consumption is low in the proposed method.

Perez, Javier, et al. [2017] the approach proposed in this paper is used to solve the problem of underwater depth map estimation problems that are occurring in low intensity of light. This problem is solved by using deep neural network by depth estimation. The results of the proposed approach outperforms and effective.

Wang, Yafei, et al. [2017] Underwater image enhancement is done by using wavelet decomposition. In frequency domain fusion based strategy is applied. This fusion process gives two inputs that are color corrected and contrast enhanced images which are extracted from the original underwater image. These images are divided into low and high frequency component by wavelet operator. Average weight is given to the low frequency for fusion and high frequency component by Multi-scale fusion process.

Rajendran, Rahul, et al. [2017] Underwater imaging is done to explore the underwater image environment. These images are used for microscopic detection, mine detection, telecommunication cables, and underwater vehicles. These images are disrupted by noise, color distortion and scattering of light which causes blurness and greenish tone. Underwater image enhancement is divided into two methods that are image dehazing and image color restoration. This paper presented a detailed survey of the approaches and methods that used in underwater image enhancement and summary on underwater image processing methods.

Li, Xiu, et al. [2016] in this paper, the author proposed image enhancement by using dark channel prior and luminous adjustment. Color distortion in images occurred due to absorption degrees changes according to light wavelength. The result of the paper shows the improved global contrast and better image preservation.

Li, Yujie, et al. [2016] introduced image de-scattering and classification by using deep neural network. This method is based on the color correction which enhances the high turbidity in the underwater images. This method removes the scatter from the images and preserves the color. It also proposed quality assessment index for performance comparison. This index combines the color distance index and SSIM index. The classification is done by using support vector machine and convolution neural network.

Banerjee, Jeet, et al. [2016] Introduced RGB YCBCR processing method for underwater images which have low contrast and poor color quality. The degradation in the water images is occurred due to scattering of light. In the proposed work noise removal is done by using linear and non-linear filters. The results of the proposed approach is compared with existing methods like Gray world, white patch and Adobe Photoshop Equalization.

Wang, Yaomin, et al. [2016] the author proposed Retina model for underwater image enhancement which improves the image quality assessment. Path discrete cosine transform is used for identification of image patches are uniform of not. The simulation results of the proposed method show its robustness and effectiveness.

Zheng, Lintao et al. [2016] in this paper, the author proposed underwater image enhancement algorithm which is based on CLAHE and USM. This method is proposed on single image and not required any additional hardware. In this associate weight maps are used to transfer the edges and color contrast to output image. Artifacts are created in low frequency component of reconstructed images. This method improves the global contrast, edges sharpness and reduced dark regions.

Table.1 Existing Scheduling Model

Paper	Algorithm	parameters	Gap
Li, Y., Zhang, Y., Xu, X., He, L., Serikawa, S., & Kim, H. (2019). Dust removal from high turbid underwater images using convolutional neural networks. *Optics & Laser Technology*, *110*, 2-6.	two-part dust removal approach is proposed. Underwater red-green minimum channel prior DE scattering is used to remove fine dust in the first stage. However, the impact of dust streaks on images is always undesirable	PSNR: improve 20% MSE: reduce 10% SSIM: improve 20%	• Not reduce blurriness • Not improve dehazing
Li, C., Guo, J., & Guo, C. (2018). Emerging from water: Underwater image color correction based on weakly supervised color transfer. *IEEE Signal processing letters*, *25*(3), 323-327.	propose a weakly supervised color transfer method to correct color distortion, which relaxes the need of paired underwater images for training and allows for the underwater images unknown where were taken. Inspired by Cycle-Consistent Adversarial Network	PSNR: improve 18% MSE: reduce 12% SSIM: improve 10%	• Not improve water blurriness • Not improve balance between noise and dehazing
Wang, W., Chang, F., Ji, T., & Wu, X. (2018). A fast single-image dehazing method based on a physical model and gray projection. *IEEE Access*, *6*, 5641-5653..	transmission map is approximately estimated using a fast average filter, the subsection mechanism is designed to avoid the high brightness of the sky region in the recovered image, the region projection method is adopted to obtain the atmospheric light, and image color compensation is implemented using the Weber–Fechner law	PSNR: improve 10% MSE: reduce 20% SSIM: improve 10%	• Not improve blueness of under water image

III. CONCLUSION

minimized exponentially with distance and depth primarily as an outcome of absorption and scattering effects. In short the low

quality of underwater images is fundamentally caused by the following factors: low contrast, blurring, the diminished true color of objects, bright artifacts, floating particles, and non-uniform lighting. These factors lead to unbalanced illumination. Subsequently, several underwater imaging methods have been established into the field of underwater image processing

IV. REFERENCES

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