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A Review on Comparative Analysis of Different Underwater Image Enhancement Techniques

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Abstract: This paper deals with different underwater image enhancement techniques. Image enhancement is process of adjusting digital images so that the results are more suitable for display or further image analysis. It means, to remove noise, to brighten an image and making it easier to identify key features. Image quality is degraded during its acquisition, transmission. There is a change in intensity, color, texture. Image enhancement removes noises from the image & improves its quality for further processing.
Keywords: Underwater image, light scattering, wavelength compensation, De-hazing, distance factor.

I. INTRODUCTION

Underwater images are useful in habitat mapping, studies of fishing and trawling, marine geology, micro topography, marine archaeology, etc. Underwater images corrupted due to color scatter and absorption. This results in low contrast and color distortion. The sea water has absorptive and dispersive nature, so the visibility of images reduces as distance increases [1]. Scattering occurs due to particles in the water [3].
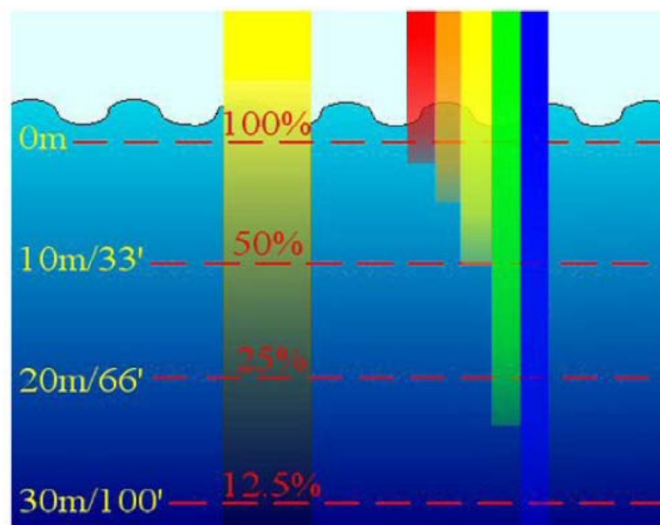

Fig 1: Absorption profile of different color components of light in water.

Figure1 shows absorption of light wave of different colors. Red color has highest wavelength, so it travels lowest distance up to two meter in pure water. Blue color has lowest wavelength, so it travels highest distance up to 30 meters in pure water.

II. LITERATURE SURVEY

A. K. Natrajan.
In 2017 K. Natrajan presents "A review on underwater image enhancement techniques" in which he discusses issues in underwater images and comparatively studied existing underwater image enhancement techniques.

B. Xiu Li, Zhixiong Yang, et.al[1]
In 2016 Xiu Li, et.al proposed "Underwater image enhancement via dark channel prior and luminance adjustment". They proposed simple but effective image prior to remove haze from single input. They directly estimate thickness of haze & recover high quality haze free image.

C. P. K. Dwiwedi, B. Paul, et.al [1]

In 2015 P. K. Dwiwedi,et.al presents "Underwater image enhancement using distance factor estimation " in which they proposed that distance of objects from scene point is based on pixel intensity & subsequent optimization technique is used for getting prominent results.

D. Bhanudas Sandbhor, G. U. Kharat.

In 2015 Bhanudas Sandbhor, et.al [1] presents "A review on underwater image enhancement techniques". They studied WCID technique and compare it with other existing techniques using PSNR ratio.

E. John Y. Chiang, Yung-Fu Chen, et.al [1]

In 2014 John Y. Chiang,et.al worked on "Underwater image enhancement using wavelet compensation and image de-hazing (WCID)". They proposed a novel method to for effectively restore image color and remove haze.

F. PoojaSahu, Neelesh Gupta, et.al [1].

PoojaSahu, et.al proposed "A survey on underwater image enhancement techniques" in 2014. They studies different underwater enhancement techniques and different noise filtering techniques. They apply median filter for transmission of input image.

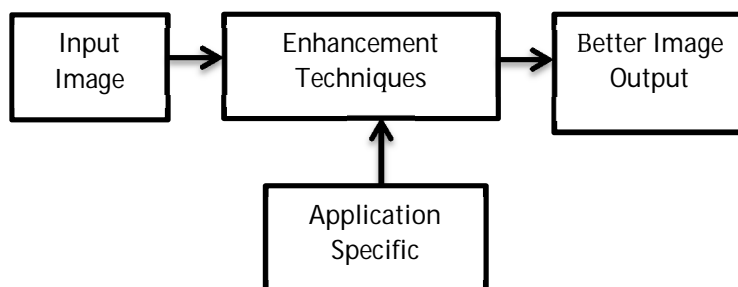## III.   UNDERWATER IMAGE ENHANCEMENT

Fig2: Basic block diagram of   Image   Enhancement

Figure2 shows the basic diagram of image enhancement process in which the specific enhancement technique uses according their applications [6]. Following chart shows different techniques and their applications.

Technique	Uses
Unsupervised color correction method(UCM)	Remove bluish color cast and achieve high quality images
Dark channel prior method	Restore original clarity of image
Histogram equalization	Contrast adjustment
Contrast limited adaptive histogram equalization(CLAHE)	Enhancement of low contrast images and special for medical images.
Color convolution with total variation	Reduce the mean squared error and increase the PSNR

Table1: Image enhancement techniques   and applications.

IV. CONCLUSION

This is a review paper focuses on a comparative analysis of different underwater image enhancement techniques. Color correction is used to enhance the color contrast of the object in underwater and remove different noise particles. Table2 illustrates the comparative approaches and the results obtained by each approach by the author in various papers published by them.

Author	Title	Approach	Result
Xiu Li, Zhixiong Yang, Min Shang, Jing Hao(2016)	Underwater Image Enhancement via Dark Channel Prior and Luminance Adjustment	Dark Channel Method	Decreased in implementation time
P.K.Dwiwedi,Biswajit Paul, DibyenduGhoshal (2015)	Underwater Image Enhancement using Distance Factor Estimation	Distance Factor Estimation	Improved visual quality.
J.Y.Chiang, Ying-Ching Chen, Yung-Fu Chen (2014)	Underwater Image Enhancement by Wavelength Compensation&Dehazing	Wavelength Compensation and Dehazing	Dehazing and quality improvement.
Poojasahu, Neetu Sharma, Neelish Gupta (2014).	A survey on Underwater image enhancement techniques	RGB color level stretching	Enhanced the color contrast and remove different noise particles
Iqbal, K., Odetayo, M.; James, A., Salam, R.A., Talib, A.Z.H (2010).	Enhancing the low quality images using Unsupervised Color Correction Method	Unsupervised Color Correction Method (UCM)	Enhanced illumination and contrast.

Table2: Different approaches and results for image enhancement

REFERENCES

[1] K. Natarajan" A review on Underwater image enhancement techniques", irjet, vol.04, issue 04, pg. 780-783, april-2017
[2] Xiu Li, Zhixiong Yang, Min Shang, "Underwater image enhancement via dark channel prior and luminance adjustment", IEEE 2016.
[3] P. K .Dwiwedi, B. Paul, D. Ghosal, "Underwater Image Enhancement using Distance Factor Estimation",IEEE2015.
[4] BhanudasSandbhor,G. U. Kharat, "A review on underwater image enhancement techniques", Ijarcsse, vol.5, issue 5, pp 676-680, May 2015.
[5] John Y. Chiang, Yung-Fu Chen, ying-Ching Chen, "underwater Image Enhancement using Wavelength Compensation and Image De-hazing (WCID), Research Gate, pp 372-383, January 2014.
[6] PoojaSahu, neelesh Gupta, Neetu Sharma "A survey on underwater image enhancement Techniques", ijca, vol.87, issue 4, pp 19-23, February 2014
[7] ShivamThakre, AmitSahu, "Comparative analysis of various underwater images Enhancement techniques", ijcsmc, vol. 3, issue 4, pp 33-38, April 2014
[8] Haochen Wen, YonghongTian, Tiejun Huang, Wen Gao,"Single Underwater Image Enhancement with a New Optical Model" IEEE 2013
[9] K. Iqbal,Michaelodetayo, Anne James, Rosalina Abdul Salam," Enhancing the low quality Images using unsupervised color correction method" IEEE 2010.
[10] Kaiming He, Jian Sun, Xiaoou Tang," Single image haze removal using dark channel prior"Proceeding of IEEE conference on computer vision and pattern recognition workshop, pp1956-1963, 2009.
[11] J Floor Anthoni 2005

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