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# UNDER WATER IMAGE ENHANCEMENT TECHNIQUE

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**Abstract:** Light scattering and color change are two major sources of distortion for underwater photography by particles present in the water before reaching the camera. This in turn lowers the visibility and contrast of the image capture change corresponds to the varying degrees of attenuation encountered by light traveling in the water with different wavelengths, ambient underwater environments dominated by a bluish tone. No existing underwater processing techniques can handle light scattering and color change distortions suffered by underwater images, and possible presence of artificial lighting simultaneously. This paper presents approach to enhance underwater images by using integrated color model technique based on the amount of attenuation corresponding to each light wavelength, color change balance.

**Keywords:** Underwater imaging, image enhancement. Contrast Stretching, Image Enhancement, HSI, RGB

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## INTRODUCTION

For the last few years, a successful movement has been started towards the direction of the improvement of image processing techniques and methods [1]-[5]. Very little research has been carried out to process underwater images.

The existing research shows that underwater images raise new challenges and impose significant problems due to light absorption and scattering .Exploring, understanding and investigating underwater activities of images are gaining importance for the last few years. Today, effects of the light and inherent structure less environment scientists are keen to explore the mysterious underwater world. However, the area is still lacking in image processing analysis techniques and methods that could be used to improve the quality of underwater images in the past, research in image processing was mainly limited to ordinary images with the exception of few approaches that have been applied to underwater images. Details can be found in [1]-[5]. For the last few years, a growing underwater world

A significant amount of literature is available on image processing, 'event detection', 'detection and tracking of objects', 'feature detection' and so forth.

This paper describes the development work on the techniques and methods for image enhancement.

## I. NEED FOR PRE-PROCESSING

The pre-processing is required for underwater images due to poor captured image quality. The following reasons justify why the pre-processing 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.

Therefore an attempt has been made to identify the suitable filter for pre-processing the underwater images

## II. UNDERWATER IMAGE PREPROCESSING

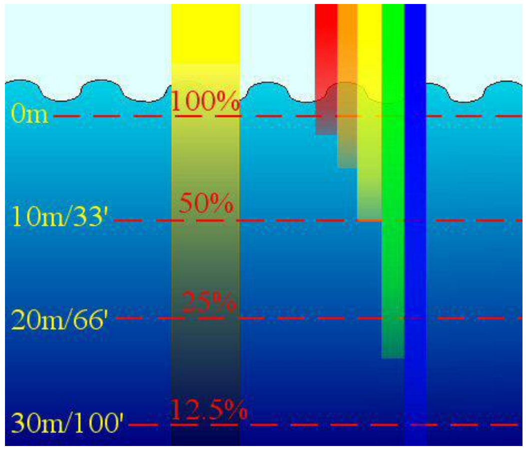
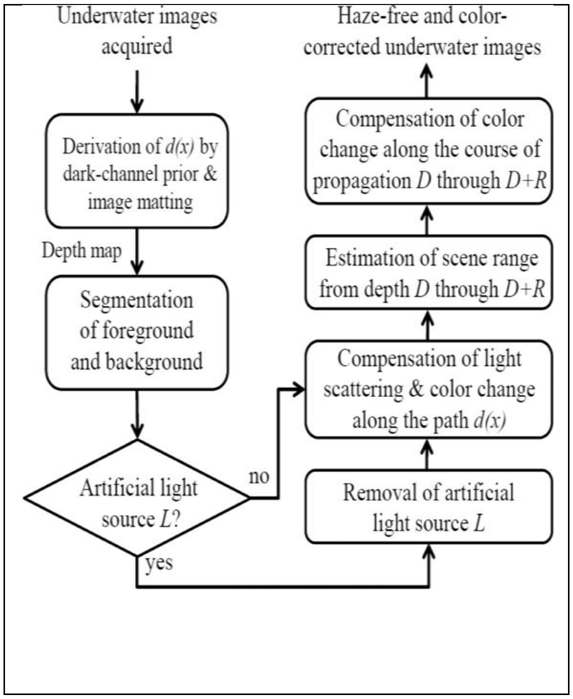



**Fig 1: Color appearance in underwater**

Regarding color correction, as depth increases, color drop off one by one depending on their wavelength. First of all, red color disappears at the depth of 3 m approximately. At the depth of 5 m, the orange color is lost. Most of the yellow goes off at the depth of 10 m .and finally the green and purple disappear further depth. The blue color travels the longest in the water due to its shortest wavelength. The underwater images are therefore dominated by blue-green color. Also the light source variations will affect the colour perception. As a consequence, a strong and non-uniform colour cast will characterize the typical underwater images.

## III. Common techniques Used for UWIE

**i**. This section presents related literature concerning underwater image processing and enhancement techniques. In 2012 Chiang, J.Y.; Ying-Ching Chen, researched on "Underwater Image Enhancement by Wavelength Compensation and Dehazing," Where Light scattering and color change are two major sources of distortion for underwater photography. Light scattering is caused by light incident on objects reflected and deflected multiple times by particles present in the water before reaching the camera. This in turn lowers the visibility and contrast of the image captured. Color change corresponds to the varying degrees of attenuation encountered by light traveling in the water with different wavelengths, rendering ambient underwater environments dominated by a bluish tone. No existing underwater processing techniques can handle light scattering and color change distortions suffered by underwater images, and the possible presence of artificial lighting simultaneously. in this seminar proposes a novel systematic approach to enhance underwater images by a dehazing algorithm, to compensate the attenuation discrepancy along the propagation path, and to take the influence of the possible presence of an artificial light source into consideration. The performance of the proposed algorithm for wavelength compensation and image dehazing (WCID) is evaluated both objectively and subjectively by utilizing ground-truth color patches Actual implementation results into images with significantly enhanced visibility and superior color fidelity after applying are proposed WCID are obtained.




**Flowchart of the WCID technique**

**ii.** In 2011 Hung-Yu Yang; Pei-Yin Chen; Chien-Chuan Huang; Ya-Zhu Zhuang; Yeu-HorngShiau, worked on "Low Complexity Underwater Image Enhancement Based on Dark Channel Prior,". Blurred underwater image is always an irritating problem in the deep-sea engineering. They proposed a competent and low complexity underwater image enhancement technique based on dark channel before. Our technique employs the median filter in its place of the soft matting method to estimate the depth map of image. Furthermore, a color improvement method is adopted to improve the color contrast for underwater image. The tentative results show that the proposed approach can well improve the underwater image and decrease the implementation time. In addition, this technique requires fewer computing reserve and is well appropriate for implementing on the supervision and underwater navigation in real time.

**iii**. In 2013 PulungNurtantio, Andono, Ketut Eddy Purnama, MochamadHariadi proposed a paper "Underwater Image Enhancement Using Adaptive Filtering For Enhanced Sift-Based Image Matching", which says ,Success of scale-invariant feature transform (SIFT) image registration is limited when attempted on camera footage taken under water Rayleigh Distribution.

This is, largely due to the poor image quality inherent to imaging in aquatic environments. In this research they aimed to overcome this shortcoming using a new method of pre-processing of true-color imagery taken under water based on the Contrast Limited Adaptive Histogram image Equalization (CLAHE) algorithm. CLAHE assumes that the distribution function of the pixel intensity values of an underwater-recorded image is dominated by Rayleigh scattering, and that the noise can be removed as a function hereof. Results showed that after applying the CLAHE image enhancement method registration success of SIFT increased by 41% compared to reference method. This research explained the preprocessing step of underwater image registration using image enhancement framework. This paper proposed a method for image enhancement using adaptive filtering base on CLAHE using

## IV. RELATED WORK

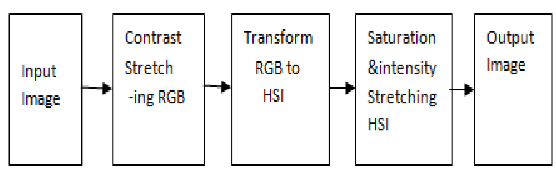



**Fig 2: Methodology under water Image Enhancement**

When the contrast stretching algorithm is applied color images, each channel is stretched using the same scaling to maintain the correct color ratio. The When the contrast stretching algorithm is applied first step is to balance the red and green channel to be slightly the same to the blue channel. This is done by stretching the histogram into both sides to get well-spread histogram. In the second step we transform the RGB image into HSI ,using the saturation and intensity transfer function to increase the true color and brightness of underwater images .Using the transform function we have been able to stretch the saturation and intensity values of HSI color model. Using the saturation parameters we can get the true color images. Brightness of the color is also considered to be important for underwater images. The HSI model also helps to solve the lighting problem using Intensity parameters The HSI model provides a wider color range by controlling the color elements of the image. The Saturation (S) and Intensity (I) are the element that generates the wider color range. In a situation when we have the blue color element in the image it is controlled by the 'S' and 'I' value in order to create the range from pale blue to deep blue, for instance. Using this technique, we can control the contrast ratio in underwater images either by decreasing or increasing the value. This is carried out by employing and redistributing the stretching value over the image variation of the maximum range of the possible values. Furthermore linear stretching from 'S' value can provide stronger values to each range by looking at less output values. Here a percentage of the saturating image can be controlled in order to perform better visual displays. The contrast stretching algorithm is used to enhance the contrast of the image. This is carried out by stretching the range of the color values to make use of all possible values.

The contrast stretching algorithm is used enhance the contrast of the image. This is carried out by stretching the range of the color values to make use of all possible values. The contrast stretching algorithm uses the linear scaling function to the pixel values. Each pixel is scaled using the following function:

$$P_o = (P_i - c) \times (b - c) / (d - c) + a$$

"Where

- $P_o$ is the normalized pixel value;

- $P_i$ is the considered pixel value;

- a is the minimum value of the desired range;

- b is the maximum value of the desired range;

- c is the lowest pixel value currently present in the image;

- d is the highest pixel value currently present in the image"

## V. CONCLUSIONS AND FUTURE WORK

In this paper, we have used slide stretching algorithm both on RGB and HSI color models to enhance underwater images. In order to demonstrate the usefulness of our approach, we have developed an interactive software tool used for underwater image enhancement. First of all, it performs contrast stretching on RGB color model. Secondly, it performs saturation and intensity stretching on HSI color model. The advantage of applying two stretching models is that it helps to equalize the color contrast in the images and also addresses the problem of lighting. By applying the proposed approach, we have produced promising results. The quality of the images is statistically illustrated through the histograms. Our future work will include further evaluation of the propose approach or .In future it is implemented for 3D images…

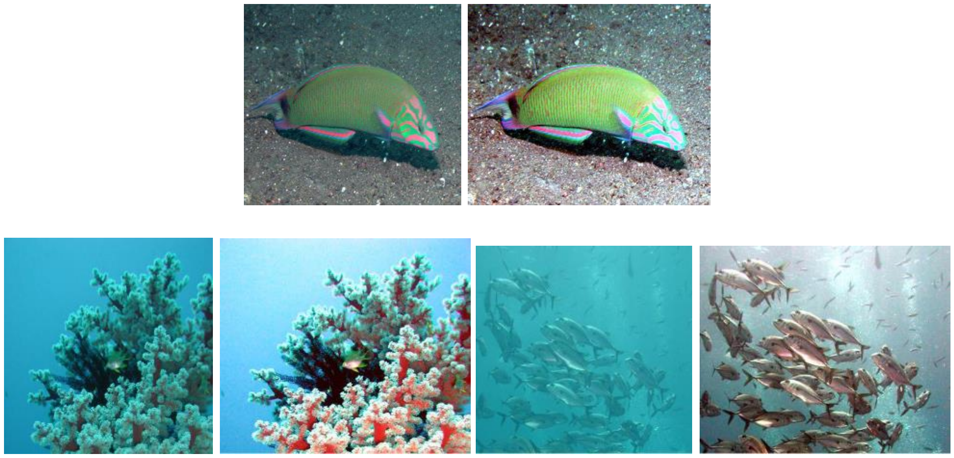


**Fig3: Comparison of Results before and After Enhancement**

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