# Under Water Image Enhancement

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**Abstract -** Underwater image enhancement and reconstruction of the underwater image is having a high priority from past few years and is also considered to be a challenging task. These underwater images can't be seen clearly with a human eye. When the digital image capturing systems are to use to capture pictures at great depths underwater, fail to take pictures with all the significant detail and such equipment is also very expensive. Thus, with the algorithms that are related to the image processing it is possible to reconstruct and improve the quality of image without using any costly image acquisition systems. We, therefore compare four different approaches for the enhancement and reconstruction of underwater images. Firstly, we use Adaptive Histogram Equalization (AHE). Secondly, we perform Gamma Correction on the image. Brightness preserving Bi-Histogram Equalization (BBHE) is the third approach taken. Lastly, we use the Contrast Limited Adaptive Histogram equalization (CLAHE).

***Key Words:*** Underwater images, AHE technique, BBHE technique, Gamma correction, CLAHE technique, image enhancement algorithms, histogram.

## 1.INTRODUCTION

As we all know deep within the ocean there are several water creatures beneath and beautiful sceneries [1]. To know more about these living beings, divers tend to capture them and showcase the deep blue ocean images to the world. Researchers always want to capture the best quality images under the water however some of them might not be clear, mostly because of some disturbances, noises that occurred while taking, additional problems like color deviation, uneven brightness, etc. So, to overcome these drawbacks we are introducing an underwater image improvement technique where an already captured image that was captured by the photographer will be simply uploaded to the site and we get a clear enhanced image. Our model will be clearing all the disturbances caused within the image and set the color corrections, clear hue, saturation, intensity, and stretching is completed and conjointly the environmental radiance is about uniform throughout the image which indeed helps us producing the quality underwater image.

## 2. LITERATURE SURVEY

Usually, when underwater images are taken, they are often blurry due to lack of illumination in the dark water environment. So, a model called Underwater image colour constancy based on DSNMFin 2017[9], Liu et al. Based on Deep Sparse Non-Negative Matrix Factorisation. This model will help us to estimate the illumination of the images. Here the image is divided into small patches and each Chanel patch is reshaped into a particular [R, G, B] matrices. These layers are going to be factorized into certain layers and the final layer with more sparseness constraint adjusts the appearance of the output image. Though it is a simple implementation it follows a factorization method where to get a high-quality image we need to follow some sequence of factorization to get an accurate image. Hence it becomes a daunting task to run it consequently and that too it takes a lot of time.

In image processing, we are having a technique called as histogram equalization technique in this the image will be adjusted to a certain contrast and change the intensity distribution. This technique can also be used for producing images with good contrast [10]. We can also call it a contrast improvement technique. But the major drawback of the technique is that sometimes it can increase the contrast of the background noise which makes the image look more over amplified. Also, it doesn't concentrate on the exact background of the image so it might give us unsatisfactory results.

CLAHE technique i.e., Contrast limited adaptive histogram equalization is the method that enhances or improves the image that is taken underwater [2]. In this technique dark channel is calculated from the input underwater image. And then processing is done using image segmentation. Now we are supposed to find out the influence of artificial light is present or not. If the influence is present, we need to use appropriate method to remove it and the apply CLAHE method. The results produced after applying this method, it will improve the visual quality by adjusting the artifacts, noise and contrast of the underwater images.

## 3. PROPOSED SYSTEM

By viewing the literature survey, we come to know the drawbacks and the problems of the existing method. So as to overcome these problems our review on this project underwater image enhancement provides researchers a solution for their problems faced.

Here we provide the image enhancement method where a user can easily register [3], login and then upload the required image and get the required resultant output image which is enhanced and clearly viewed by any user as the colour equalization, stretching, disturbances in the input image are cleared.

*A. System Architecture*

The system architecture of proposed system can be divided into 7 steps. The flow chart is as follows.

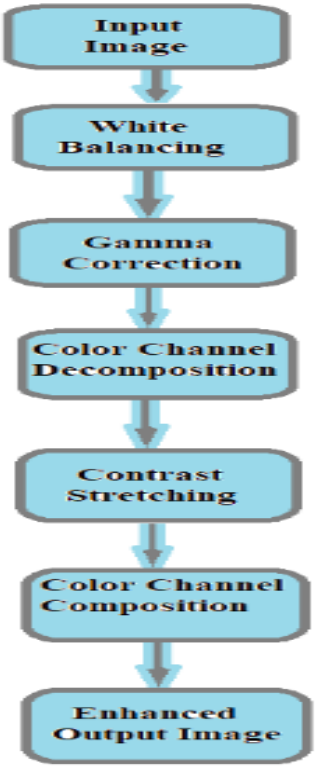


Fig .1 System Architecture\

Input image is an image that is captured under water. Techniques such as preprocessing, white balancing, gamma correction, histogram mapping, contrast stretching are applied to the image. White balancing is the method that is used to remove the uunwanted color casts and it is used to equalize the colours under different types of light.

Gamma correction is the approach that amplifies the intensities by using the factor gamma. Amplification is less for lighter tones when compared to dark tones. This gives us the nonlinear output [4]. Changing the gamma value can change the RGB ratios and also overall brightness. The color channel of overall image is decomposed according to the RGB components.

Contrast stretching in RGB can also be called as normalization. This method is used to increase the contrast by stretching the intensity values to the range of desired. Color channel composition is done and generates the enhanced image as output.

**4. ALGORITHM**

Here we are using unsupervised color correction algorithm. This algorithm consists of various steps in order to produce the enhanced image as output.

- Step 1: RGB equalization

The Histogram equalization (HE) could be a technique developed for image distinction sweetening of gray scale pictures. For RGB (Red, Green, Blue) color pictures, the he's sometimes applied within the color channels separately; because of correlation between the color channels, the color property of colors is changed.

- Step 2: Stretching

Stretching (often referred to as normalization) may be a straightforward image improvement technique that tries to enhance the distinction in a picture by 'stretching' the vary of intensity values it contains to span a desired vary of values, the complete vary of component values that the image kind involved permits.

- Step 3: HSVS stretching

The HSV Stretching is almost similar to the Stretch Contrast command, but the only difference is that it works in HSV colour space, rather than RGB colour space. HSV Stretching independently stretches the range of the Hue, Saturation and the Value components of the colour and HSV Stretching preserves the Hue.

- Step 4: Scene radiance

Global constant, which means that the environment radiance must be uniform throughout the whole image.

**5. METHODOLOGY**

Build a user interface where a user can register or login. If a new user is using the website the user interface asks for the user registration followed by the login process. After successful login user navigates to the home page of the website where the user can see few buttons at the top right corner. One has to select upload in order to upload the underwater image that has to be enhanced.

Now at the back end the unsupervised color correction algorithm is applied to the image that is uploaded, it generates the enhanced image as the output.

To view the output, user must select the view image icon.

**6. ADVANTAGES**

Clicking clear and high-resolution photos underwater will convince be a tricky task given the extreme absorption and scattering effects of the medium. Therefore, image improvement techniques are applied to get rid of image noise and improve overall image clarity.

Under water image improvement finds plenty of application in multiple range of diversified fields. It finds use in examination of underwater infrastructure and detection of any unreal objects.it is conjointly accustomed perceive marine biology analysis, for environmental analysis, for the

analysis of monuments submerged in water and for underwater guidance observance in submarines.

Underwater image improvement is additionally crucial within the system of beneath water [6] vehicles and to see the cultural heritage of archaeology sites submerged under water. Also, study of underwater formations like coral reefs depends heavily on underwater image improvement

## 7. RESULTS

**Fig 2 Input image**

**Fig 3 Eenhanced output image.**

Here, in the result we can observe the enhanced output image which is different from the input image. After uploading the input image on to the website by applying [7] UCM the image is enhanced and the result of the image is obtained. All the disturbances, noise, hue, colour equalization is done and the resultant clear image is shown in the output.

## 8. CONCLUSION

The enhancement of underwater pictures may be a challenge in itself, due to the assorted factors moving the no heritable image the employment of varied image sweetening techniques like AHE, GC, BBHE and CLAHE may be want to improve the no heritable picture's visual look. The selection of the technique plays a major role in image sweetening. the consequences of noise, blurring, restricted visibility on a picture will thus be reduced. within the future we might wish to work on building [8] Associate in Nursing algorithmic rule that helps to reconstruct pictures taken beneath different liquids, whereby the quantity of wavelength absorbed by the liquid is totally different in comparison to water. Also, from our analysis conducted, we have a tendency to conclude that AHE and CLAHE techniques performed comparatively higher than Gamma Correction and BBHE ways.

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