# REVIEW OF UNDER WATER IMAGE ENHANCEMENT TECHNIQUE

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***Abstract***

*Image enhancement is the process of improving the quality of the input image so that it would be easily understood by viewers. It improves the quality of image without any information loss. The image captured in water is hazy due to the several effects of the underwater medium. The underwater medium is not friendly for imaging data and brings low contrast and fades color issues. In the underwater images a lot of noise occurs due to low contrast, poor visibility conditions (absorption of natural light), non uniform lighting and little color variations, scattering of light from different particles of various sizes and blur effect. There are the various different filtering techniques that were established by the researchers to improve the contrast of the underwater images. The main objective is to enhance the contrast of the underwater images while without lose the brightness of the images. This review paper provides an overview and compares the various analyses of the image enhancement techniques for enhancing the underwater images.*

***Keywords***: *Image Enhancement, Underwater Images, Hazing, Color Contrast, Noise.*

## 1. Introduction

Image enhancement is the mechanism to process the input image to make it more appropriate and clearly visible for the Viewers. An image enhancement improves the information content of the image and increases the visual impact of the image on the observer. Image enhancement indentifies the features of the images. It identifies the image features like edges, contrast to build display of photographs more useful for examination and viewing of the images. Underwater images are corrupted due to scatters resulting in low contrast and color distortion. Captured underwater images suffer from poor visibility. .For capturing a clear visible underwater image, water must be a limpid or clear, but naturally all the water is turbid with particles such as sand and minerals. But outdoor images are distorted because of particles present in the air; like that underwater images also get distorted because of particles present in the water.

Underwater Images becomes more and more hazy or less visible as water depth increases. Generally underwater images get distorted because of two reasons. One is light scattering effect and second is color change effect. When light enters the water it got refracted , absorbed and scattered as water is denser medium then air , so the amount of light drops when it enters from air to water and got scattered in different directions. Scattering causes the blurring of light and reduces the color contrast. Color change corresponds to the varying degrees of attenuation encountered by light travelling in the water with different wavelengths. No existing underwater processing techniques can handle light scattering and color change distortions suffered by underwater images.

This paper deals with many image enhancing techniques developed such as white balance, color correction, dehazing and fuzzy based methods.

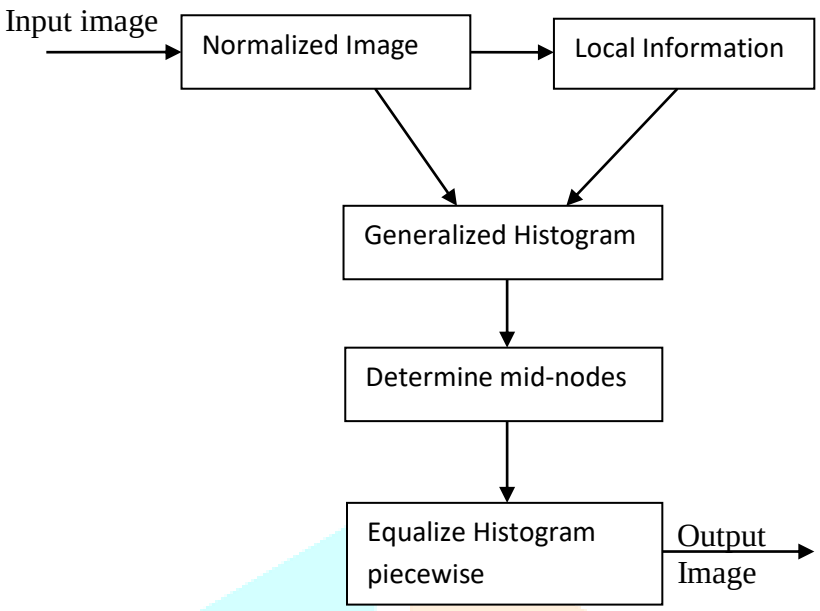


**Figure 1: Basic Block Diagram of System**

## 2. Literature Survey

**Table 1 Underwater and Satellite Image Enhancement Techniques**

| *Enhancement Scheme* | *Merits/Features* | *Drawbacks* |
|---|---|---|
| A Novel Algorithm of Local Contrast Enhan-Cement For Medical Image (Hsueh et al… 2007) | • Proposed Bi-histogram Equalization to prevent unexpected effect of Local brightness Correction. | • Generate image might not have natural Appearance |
| A new approach for Core Satellite Image Enhancement(Boon watt Attachoo et al…..2009) | • Sharpening with Lap-Lacian filter performed The most accurate result. | • Does not Preserving Brightness |
| Survey of Contrast Image Enhancement Techniques Based on Histogram Equa-Lization(ManpreetKaur et al…2011) | • Compare the various image Enhancement Technique like HE,BBHE and DSIHE | • Natural appearances And the brightness of the image is lost |
| Enhancing underwater images And videos by fusion( CosminAncuti et al….2012) | • Image segmentation and matching images by local features point | • Illumination is poor |
| A way of Image Fusion Based in wavelet Transform(Zhang et al….. 2013) | • Simple calculation fast Superposition and Perfect Fusion | • Wavelet bands increase the brightness |

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| Investigation of Image Fusion for Remote Sensing Application (Dong Jiang et al…..2013) | • Multi sensor image Fusion improving overall performance | • Applying for particular application |
| Enhancement Techniques and Methods for MRI a review(velusamy et al….2014) | • Comparisons for Pre-processing and Segmentation technique | Used for Real time System |
| Histogram Equalization for image enhancement using MRI brain images (Senthikumaran et al… 2014) | • Compare GHE,LHE, AHE and BPDHE are different HE techniques | • Degraded sharpness creates artifacts and does not preserve brightness |
| Human Visual systems inspired underwater images Quality measures (Panetta et Al… 2015) | • Underwater Image Quality Measure (UIQM) Effectively measure the quality of the underwater images | • This technique measures separately the contrast and sharpness which is time consuming |
| An Underwater Color Image Quality Evaluation Metric(Yang et al.... 2015) | • Proposed Metric has fast processing time and shows better correlation and subjective evaluation | • Illumination is poor |
| An Improved Method For The Enhancement of Under Ocean Image(Bhowmik et al.... 2015) | • Proposed Metric has fast processing time and shows better correlation and subjective evaluation | • Does not deal with turbulence of sea water and salinity factors |
| A Dataset to Evaluate Underwater Image Restoration Methods(Duarte et al ....2016) | • Improves the image visibility and have a more robust behaviour | • Hard to design the multiple priors restoration methods |
| New Image Enhancement Technique for WMH Segmentation of MRI FLAIR Image (Isa et al... 2016) | • White Matter Hyper- Intensities show better image features | • Absence to deal with Delineation Images by radiologists |

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|---|---|---|
| MRI brain image enhan- cement using Histogram Equalization Techniques (Hardeep Kaur et al.....2016) | • Enhance the brightness of the image and reduce the noise | • More techniques that deals with MRI images |
| Underwater Image Enhan- cement by Wavelet Based Fusion (Amjad khan et al.....2016) | • Proposed methods enhance the quality of the hazy underwater images | • Comparison with more techniques |
| Underwater Image Enhan- cement Method Using Weighted Guided Trigonometric Filtering and Artificial light Correction (Huimin Lu et al .....2016) | • WGTF preserves edges, remove noise and reduce the computation time | • Reduce the image contrast |
| Color Balance and Fusion For Underwater Image Enhancement(O. Ancuti et al.....2017) | • Enhance the various features like depth and light condition of underwater images | • Sharpness increase reduce the natural appearance |
| A Review Of Underwater Image Enhancement By Wavelet Decomposition Using FPGA (Venktesh et al .....2018) | • Improving contrast and color correction | • Side Effects lost the performance |

## 3. Problem Identification

Image enhancement is the process of improving the quality of the input image so that it would be easily understood by viewers. It improves the quality of image without any information loss. The image captured in water is hazy due to the several effects of the underwater medium. The main objective is to enhance the contrast of the underwater images while without lose the brightness of the images. To find the problem in the underwater image enhancement the literature work we have defined above shows various problems like the techniques that will used by the earlier researcher is take the input image and set the threshold value manually. When the threshold value is increases the image is not clearly visible. This is the very serious issue in which the image is blurring. We have to account of these issues and solved it by using different technology which is auto threshold.

## 4. Outcomes

Image enhancement techniques have gained attention of researchers from early years. Image enhancement improves the appearance of image and enhances the finer details of image having low luminance. These enhancement techniques can be broadly divided into two categories – transform domain and spatial domain. In today's world many techniques are used for images enhancement. But my new image enhancement output is better pervious image enhancement. An image that contain high contrast and well defined ridges and valleys, are called as good quality image while a poor quality image is marked by low contrast.

## 5. Future Scope

The underwater images quality degraded due to scattering of light, refraction and absorption parameters. To resolve these issues and to improve the quality of an underwater image, a number of techniques are proposed in recent years. We have done literature survey on the underwater image and conclude that the technique used by earlier researchers does not give the accurate result. A review of underwater image enhancement is presented

covering basic enhancement technique, issues and challenges and existing techniques for underwater image enhancement. In our future work we think that we are using better techniques that increase the contrast and illumination of the underwater image without any loss of information.

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