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Image Enhancement in Underwater Communication using Fusion and Color Balance Technique

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ABSTRACT : *Underwater images are dishonored because of the absorption and scattering properties. Image improvement is a procedure of improving quality of image. Due to instability in the flows of water, the images get blurred with a low contrast. The wavelength gets expurgated in underwater depending on the complexity of the water that causes fading of color objects. This paper provides an effective method to enhance the image captured in the underwater. These images are captured using underwater vehicles. Our proposed enhancing method uses a single image as input. The degraded image is first enhanced using white balancing method, which improves the undesired color cast and enhances the edges of the image. This method derives two output images which are used by the gamma correction and sharpening method as inputs. The edges of the image are shaped using this technique. We also use a multiscale fusion strategy. Compared to other image processing algorithms the proposed approach is better. And it also advances the precision of diverse image processing applications.*

KEYWORDS - Enhancement, *Image, Underwater Image.*

I. INTRODUCTION

Underwater imaging is used in different fields of expertise and technical inspect, example discovery of manmade objects, inspection of underwater structure and cables, governor of underwater vehicles, oceanic biology research and archaeology [1]. Images of underwater are blurred because of the dispersion property and absorption. The absorption reduced the light energy, and light propagation direction changes due to the scattering effects. Hence the images are seemed as foggy and contrast degradation, making the objective hazy. Generally underwater images, the things at a reserve of greater 10 meters are nearly unimportant [2], [3]**.** In underwater depending on the depth of the water the wavelengths are cut there for the colors of the underwater images are faded. Several attempts are taken to reestablish and improve the discernibility of such degraded images. For such task the traditional attractive method example histogram equalization, gamma improvement appears to be strongly incomplete**.** In this paper we present an innovative method to eliminate mist in submerged images. As illustrated in the Fig.1 single image is processed using white balance method and then correcting by means of gamma correction and sharpening method these two derived inputs are then combined created on a multiscale combination procedure. The shade cast list brought by the luminous sprinkling is removed by white balance method. And the result of the multiscale combination method is an object free mixing.

II. LITERATURE SURVEY

Yan-Tang Peng has proposed a technique for reestablishing images of the underwater which is constructed on image haziness and captivation of light as shown in fig.1. To enhance and restore the degraded underwater images this method is used in the image development model. Via color channels depth is not estimated, it is likely to reestablish images of underwater correctly [4].

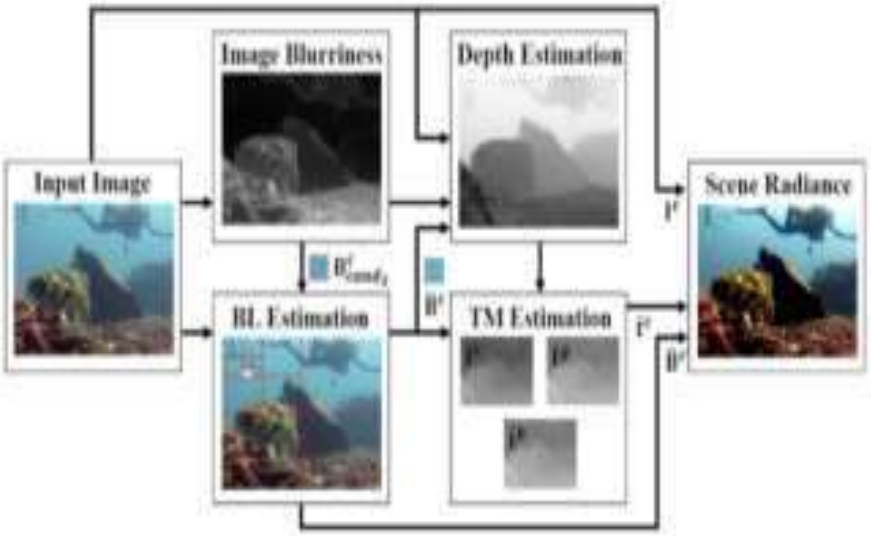

Figure.1 Flowchart

The fig.1 shows the flowchart of projected technique, which provides the depth estimation and exact BL. In underwater images there are fuzzy regions from that, BL is selected. Based on BL the TMs and depth map are achieved. The important measure of the depth is haziness, which can estimate by both image blurriness and light immersion [5]. Artificial light is used for taking underwater images. Depending on bright fascination, depth approximation can switch false illumination. The light produced from artificial lighting source is reflected by foreground objects. This light dispersed and less absorbed in the water. Red light from the contextual pixels would reduce more when BL is bright using this proposed method, we can restore corrupted images and enhance the faded images in a better way [6].

Approximation of air light by computing shady station preceding and then complexity chart is produced by means of intermediate filter. Next step is improving pictorial excellence of images of underwater; an unsubstantiated color improvement technique is used to progress the color distinction of item. By means of shady channel prior the atmospheric light is assessed. Substantial calculating properties and several iterations for smoothing and enhancing the broadcast is required to reconstruct a better image in the ark channel prior method [7].

Amjad Khan suggested a wavelet-based fusion method to improve the foggy submerged images by addressing the low contrast and color alternate problems as in fig.2. Initially, the hazy degraded underwater image is simulated into two categories. To improve the image contrast and quality these two categories are processed. Sequence of high pass filter and low pass filter sets consisting of wavelet based fusion process are used [8], [9].

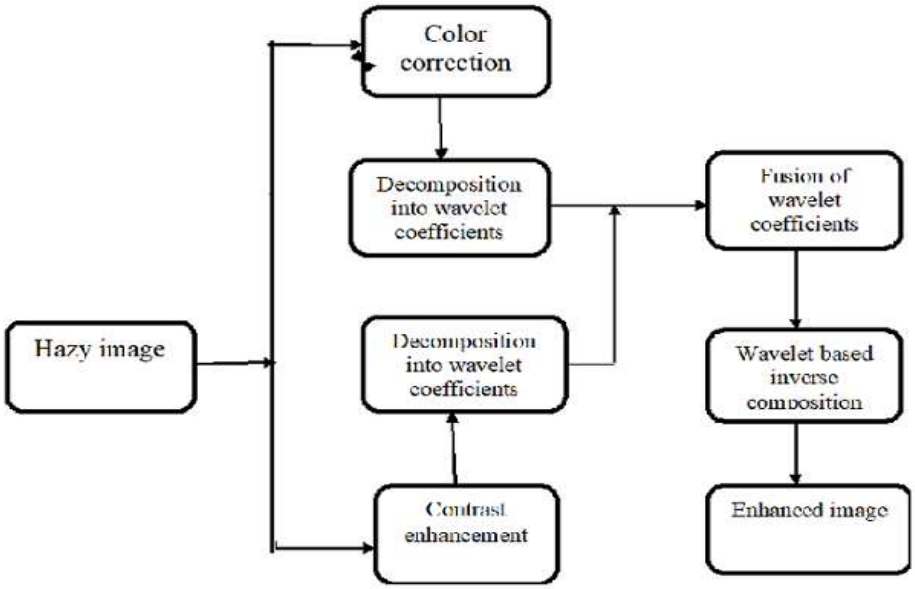

Figure.2 Flowchart of proposed by Amjad Khan

To remove unwanted low frequency and high frequency existing in an image and kind the synthesis procedure suitable a arrangement of low pass filter and high pas filter sets are used. There are two levels of decomposition. In level one there are two steps. The first step consists of the operation which includes high pass and low pass filters on the rows of given degraded image along with the down sampling. This results in the generation of horizontal calculation and horizontal information. For the next step the input is considered from the output of the first step. This process is repeats until all quantities are measure down. Each tarnished input image can be disintegrated using this same method. Finally, both decompositions are fused by using coefficients of maximum values [10], [11].

III. FLOW DIAGRAM OF PROPOSED WORK

The key advance is as a substitute of combining several images occupied in different atmosphere it uses only the original degraded image. This is the core idea belated our method. The important point is choosing appropriate input and weight map images in this approach.

3.1 Input Images

After working on original image, we obtain an image which is termed as input. Distorted substances and enormous quantity of unlikely colors suffers major distortion in underwater images [12].

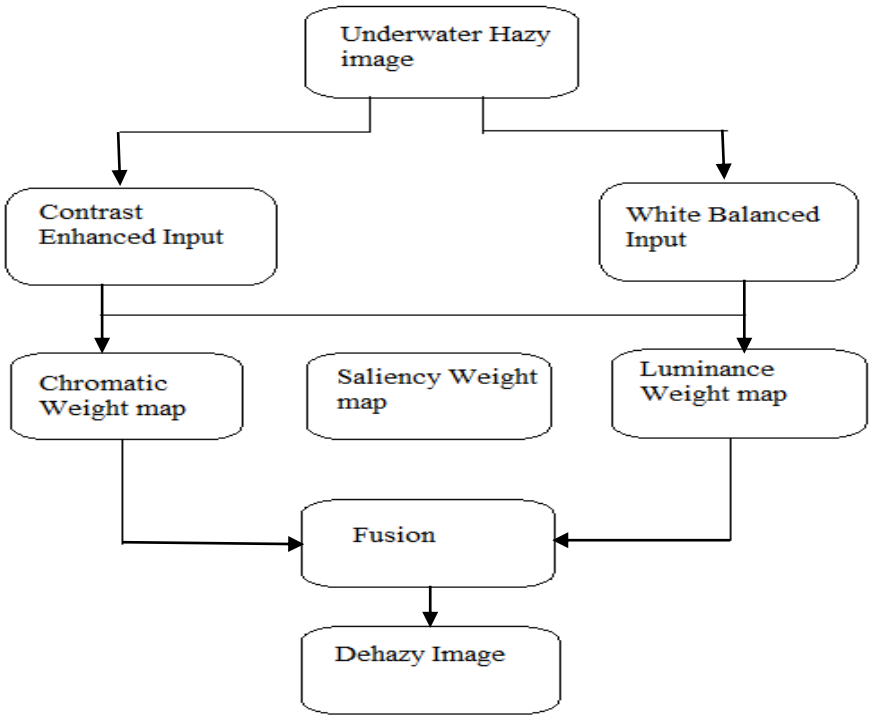

Figure.3 Flow chart of White balance technique

3.2 Contrast Improved Image

Absorption and Scattering of bright in stream lead to deprivation of imagery seized in the water. The deprivation comprises undistinguishable objects, reduced color, little luminosity. Underwater image improvement fusion-built technique is projected to improve the excellence of image. It focuses on improving color of underwater images and contrasts using Auto white balance and difference stretching. In this technique, the strength principles of pixels are prolonged to chosen array as in fig.3. Disparity improvement is the technique used as the benefit that it will not spring severe outcomes on images [13], [14].

Weight Map Images:

1. Luminance weight map image

2. Chromatic weight map image

3. Saliency weight map image

In this approach weight maps are using the final image that have the pixels and with high weight values which are represented during blending method.

1. Luminance: the mean value to style white matters come out white in image, sometime it decreases the colorfulness of image. The images have better visibility luminance weight map assign advanced value of that region and it assigns the minor value capacity to another areas of image [15], [16]. In the image low saturation value corresponds to distorted and hazy regions. The high saturation values describe distinctly visible parts. Therefore, in final the output image has higher visibility in regions are highlighted compared to lesser conspicuousness. It has actual fewer influence in concluding result.

2. Chromatic: Chromatic maps are used to work on increasing the saturation of the contrast improved images and color balanced. The combination of colors having large wavelength it leads to loss of colors in image. Using chromatic weight map restoration of colors is ensured.

3. Saliency: To employ this plot in our method, by applying Gaussian 3CE3 filters essential equally contrast improved images and white balanced are unburned. After that, it converts RGB to CIE color space and calculates the average value of each color channel. Saliency used to make the reality of these regions prominent with high opinion to their neighborhood. The resulting image computed using Saliency graph that exhibit far above the ground assessment quality along with the lead of lifting main regions.

3.3 Fusion

From the prior method that is luminance, saliency and chromatic weight map after generating all weight map images, it is essential to fuse each input with resulting weights. Fusion is the blending of different inputs and weight maps. It is essential to fuse each input with resulting weights. Fusion is the blending of different inputs and weight maps. The data present in the unique image will be present in the final image after fusion [17], [18].

3.4 White Balancing

In our approach it adopts two strategy, image fusion and white balancing. Colorless image fusion is measured to enhance the edges and information of scene to relieve the passing of dissimilarity ensuring from move backward scattering. The aim of white balancing is improving the image aspects primarily by removing the undesired affect scheduled to decrease properties. In submarine the perception of color is kindly associated with the gravity [19], [20]. A valuable drawback is the green bluish appearance that desires to be rectified. White balance flow chart is shown in fig.4.

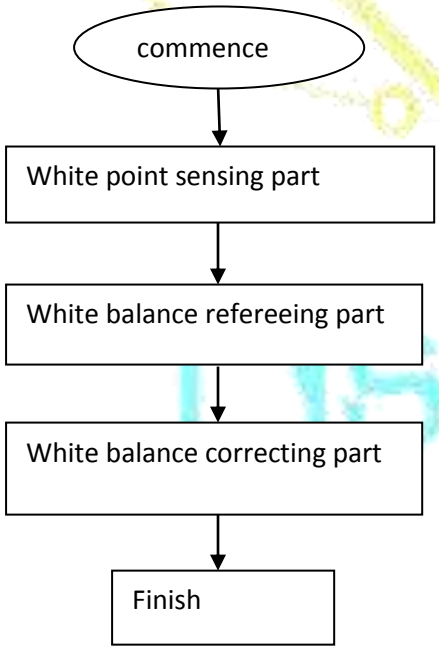

Figure.4 White balance method flowchart

In practice, loss of color and attenuation depends on total distance between the scene and the observer.

3.5 Multi Scale Fusion

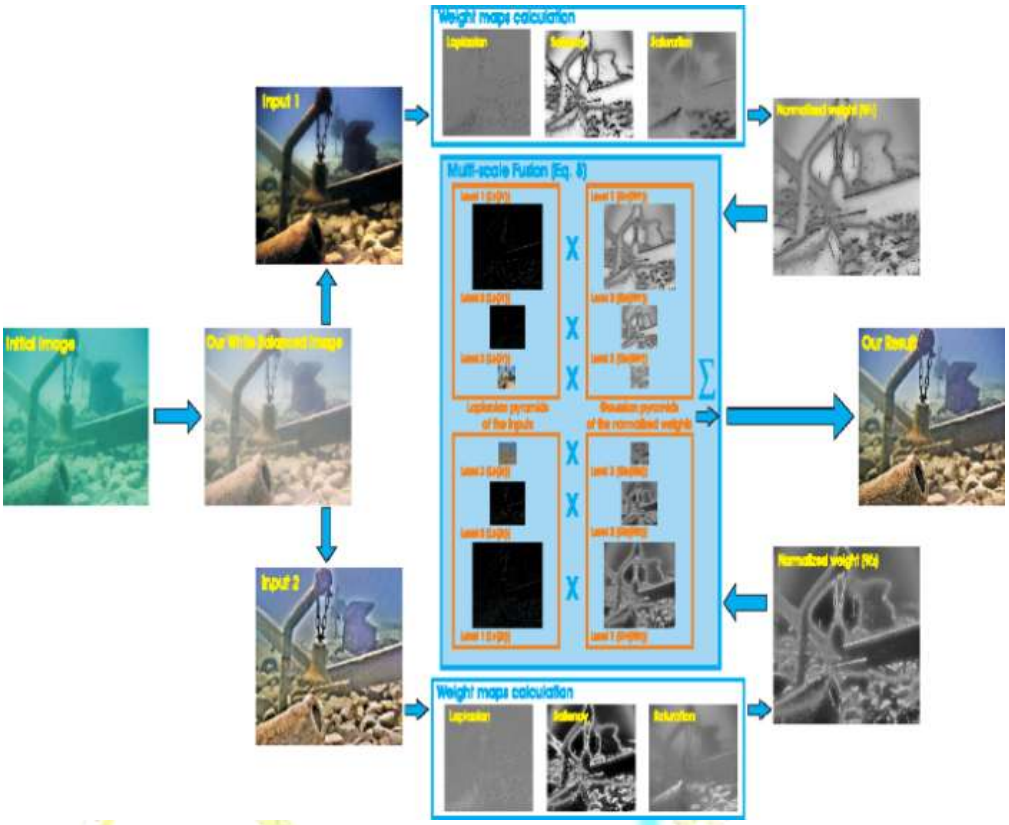

Figure.5 Multiscale fusion diagram

We use a multiscale fusion algorithm to combine two output images derived from gamma correction and sharpening method. There are several applications in image fusion such as HDR imaging, image composition etc. Two of kind inputs are introduced, correspondingly to enhance the color contrast and edge sharpness of the white balance image. And weight maps are defined to maintain the qualities and disallow the defaulting of these inputs that overcome the artifacts induced by the light propagation limitation in submarine method. In fig.5. multiscale fusion diagram is shown.

3.6 Gamma Correction

Gamma correction or basically gamma is a nonlinear act to encode and decode luminance or tristimulus morals in cassette or silent image system. Gamma adjustment is a non-liner adjustment to unique pixel values. Where as in image normalization we agreed out liner operation on creature pixels, such as a scalar multiplication addition, subtraction, gamma alteration cares out a non-liner action on the image pixels, and know how to root diffusion of the image altered.

3.7 Sharpening

Sharpening as in fig.6. is a process which compare between clear and mysterious regions. It is a technique for increasing the apparent sharpness of an image. The edges of the image are shaped using this technique. To bring out features improving an image raises the difference between dark and bright areas.

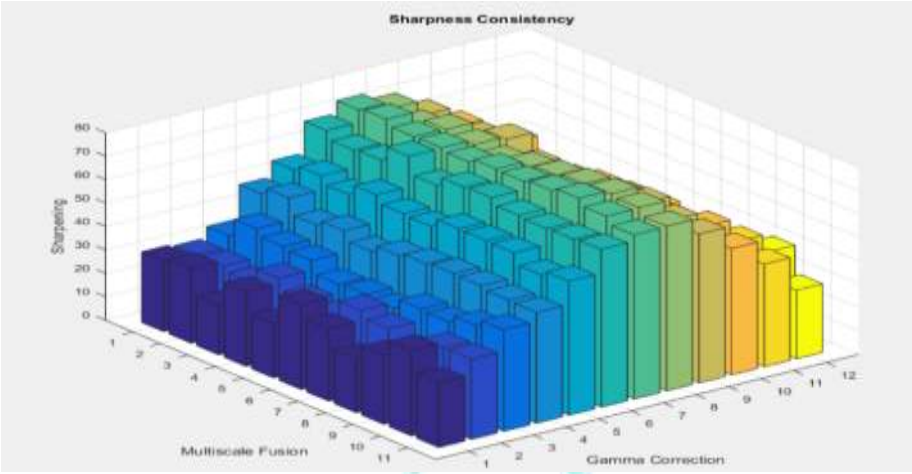

Figure.6 Sharpness consistency

IV. RESULTS

In this section, we first achieve our white-balancing output. We will link it with dehazing method with the specific underwater renewal methods. At the end we get our enhanced image.

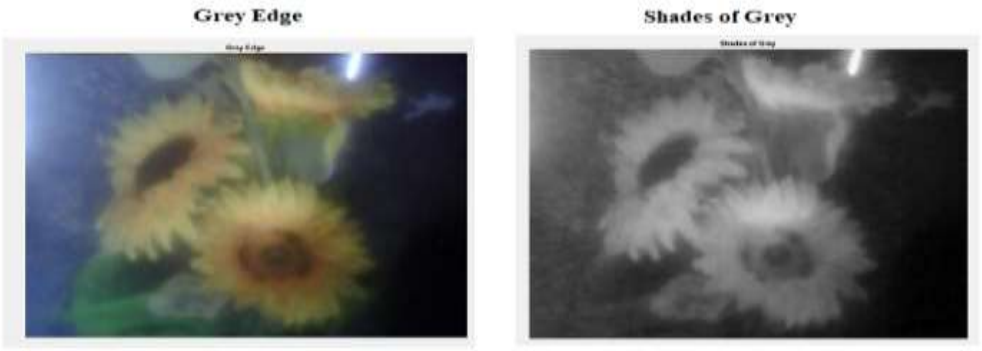

Figure.7 Grey edge and shades of grey image

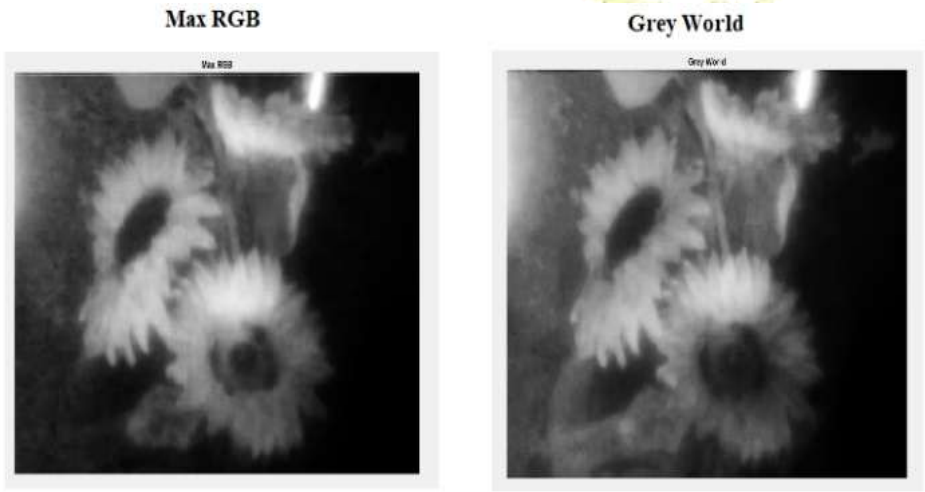

Figure.8 Max RGB and grey world image

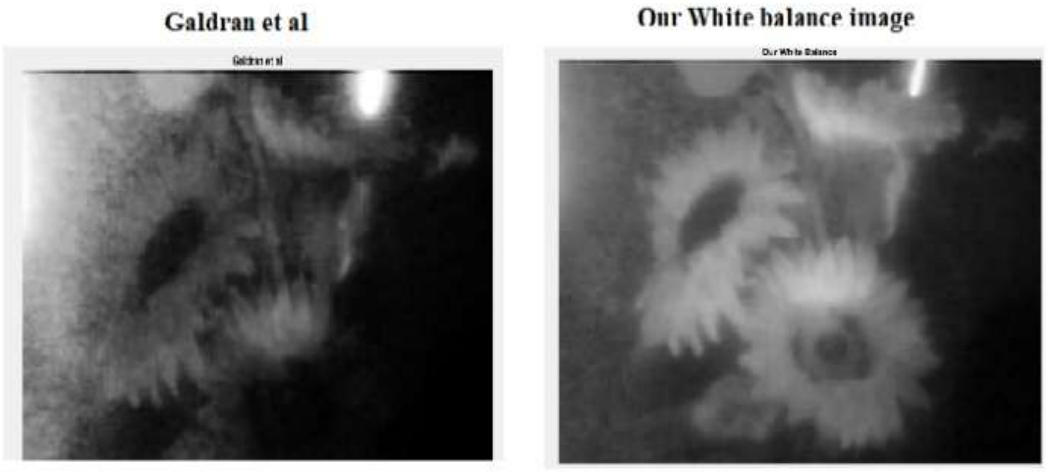

Figure.9 white balance image

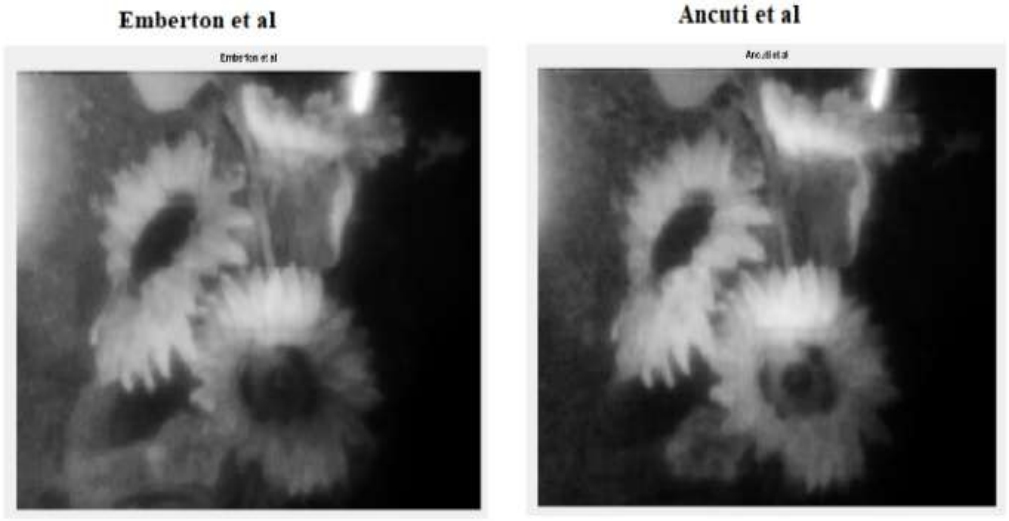

Figure.10 Emberton et al and ancuti et al image

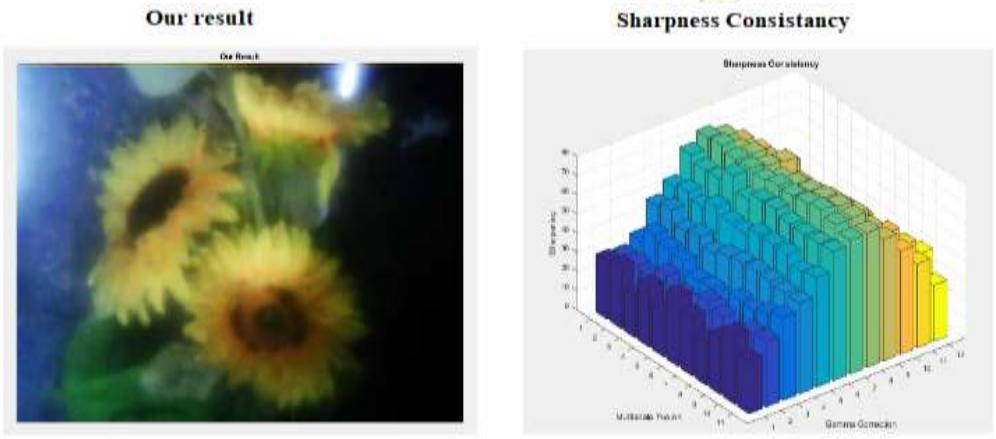

Figure.11 our result and sharpness consistency

4.1 Grey Edge

Grey edge process accepts that the typical reflectance in the section is a chromatic. Hence the illuminant color spreading is just assessed by be close to each station self-sufficiently. Grey edge and shades of grey is shown in fig.7.

4.2 Shades of Grey

This is a grey scale image. The grey scale images are nothing but the images which are unclear. The colors consist by these images are neither white nor black but are in a grey color. They only have grey shades. This type of images gives very less details about the pixels.

4.3 Max RGB

Max RGB (Red Green Blue) is a unassuming and wild color reliability algorithm that guesses the light basis color from the max reply of the dissimilar color networks. First split the image into its respective blue, green and red components. After performing the R G B operation, use a max method. At each coordinate across all three RGB channels, the max intensity value can be find using this method. Fig. 8 shows max RGB and grey world image.

4.4 *Grey Word Algorithm*

Grey world algorithm realizes moral graphic presentation for sensibly partial underwater acts. It is used to eliminate the bluish quality. Grey world is among the simplest estimation methods. An image looks like a natural image, when all elements are arranged in a proper way. In this type of images, the average of all color is nonaligned grey. This method can illuminant color cast and compare with grey.

4.5 Galdran et. al.

Underwater dehazing approaches of Galdran et al are useful in recovering the visibility of the considered area.

4.6 Our White Balance Image

Because of underwater light scattering, improbable color casts are generated. These unwanted color casts are removed using White balance method. White balance image is shown in fig.9.

4.7 G.Emberton et. al.

Emberton et al gives underwater dehazing approach uses color-based segmentation, that can be untrustworthy in gears where, because to the effect of the medium, the color of object underwater appears similar to the color of the pure fog areas.

4.8 Ancuti et.al.

Image blending procedure is used by Ancuti et.al, to improve the underwater degraded images. Their process uses grey technology to perform color modification to improve image. Then this image was denoised, finally multi resolution analysis is used to synthesize the enhance image. Emberton et. Al and Ancti et.al are shown in fig. 10.

4.9 Our Result

Max RGB and grey edge systems are not able to eliminate whole color troupes. The grey world and shades of grey strategy shows the recovering result, but our proposed white balance strategy gives the better result than other techniques. Our results are shown in fig.11.

4.10 Sharpness Consistency

When an image looks clear in terms of both focus and divergence then the sharpness of that image is good. Sharpness enhances the edges of the image and give a detailed image. In this paper bar pattern is used to represent sharpness consistency**.** The sharpened output image displayed using 3D graph.

V. CONCLUSION

We have provided an different method to improve the degraded blurred underwater images. Our approach is built on a white balancing and fusion principle. We first achieved white balancing output and then compared it with technique to get enhanced image. We have given approach which is able to improve a extensive choice of underwater image. It is undoubtedly detected that our planned process produces better results compared to other enhancing approaches. Our proposed method is used by several image enhancement applications. The future of this method is to extending the algorithm by using progressive method to improve the results.

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