



# UNDERWATER IMAGE ENHANCEMENT USING IMAGE PROCESSING TECHNIQUE

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**Abstract :** Image enhancement is the major process in the image processing techniques. Image enhancement would increase the sharpness and intensity of the underwater images. By increasing the factors of the pixels, the object can be visible clearly in the underwater images. Photograph fusion is the mixture of two or extra unique graphics to kind new snapshot through making use of a detailed algorithm. Photograph fusion is the approach of producing a single fused snapshot utilizing a set of input pics which are assumed to be registered. Enter image would be multi-sensor, multimodal, multifocal, or multi-temporal. This paper grants a literature overview on one of the most photo fusion procedures and photograph enhancement systems. The input image is first pre-processed. Then HWD transform is applied on it for sharpening the image. The low frequency background is removed using a high pass filter. Image histograms are then mapped based on the intermediate color channel to reduce the gap between the inferior and dominant color channels. Then Wavelet fusion is applied followed by adaptive local histogram specification process. The resultant images processed through the proposed approach could be further used for detection and recognition to extract more valuable information. Image Enhancement is to procedure the input image in any such means that the output image is more compatible for interpretation by the humans as well as by way of machines.

## I. INTRODUCTION

Image enhancement is the technique for processing the input underwater image to result it in a proper and clearly visible image which can be used for the various research applications. This image enhancement technique is helpful for improving the information which is present in the image. This image alters the visibility of the image which is useful for improving the image information for the observer. Image enhancement in the underwater images would be difficult task as it would eliminates the information which is present inside the image while the enhancement process is carried out. Image enhancement identify the feature of the image. Enhancement process is carried out by increasing the image features like edge, contrast to increase the photographs for the research and study. Qualitative objective approach is used for the enhancing process to show the impressive images. Image enhancement includes many operations such as contrast stretching, noise clipping process, pseudo-coloring, noise filtering technique. Active range of the features of image have been amplified by the various detected features. Various existing algorithm of the enhancement process shows the images have the poor quality because of the nature of the light. When the light is entering into the water, the light get refracted and it was absorbed and scattered as the water is denser medium than air. This light drops occurs when the light entered into the water and got scattered into the different directions. Scattering from the light caused by the blurring effect of the light and the reduction of color contrast. These effects changes in water in underwater images are not only by the nature of the water but also by the organisms and other material which is present in the water. Light have the different intensity and different wavelength according to the blue, green, red colors present in the water.

## II. METHODOLOGY

### 1. Image Acquisition:

- i. Underwater image acquisition requires specialized equipment due to the unique challenges posed by the underwater environment. This includes factors like low light conditions, color distortion caused by water, and turbulence.
- ii. When an image is captured underwater, it's typically in RGB format, containing information about the intensity of red, green, and blue light in each pixel.
- iii. During pre-processing, the algorithm analyzes the pixel values to determine the areas of the image that are in focus and of interest. This is done by identifying pixels with higher contrast or sharper details, indicating they are more likely to contain useful information.

2. Pre-processing:
  - i. Pre-processing involves preparing the image for further analysis or enhancement.
  - ii. Converting the RGB image to grayscale simplifies it to a single channel, which can facilitate certain image processing tasks. Grayscale images are often easier to work with and can help highlight important features without the distraction of color.
  - iii. Filtering techniques are applied to remove noise from the image. Noise can manifest as random variations in brightness or color and can degrade image quality. Filtering algorithms smooth out these variations while preserving important image details.
3. Detection:
  - i. Detection focuses on further improving the quality of the image to make it more suitable for analysis or visualization.
  - ii. The HWD (Hough Wavelet Decomposition) transform technique is utilized for image enhancement. This technique combines elements of the Hough transform, which is commonly used for feature extraction, and wavelet analysis, which is effective for denoising.
  - iii. By applying the HWD transform, the algorithm effectively removes noise from the image while enhancing important features. This results in a clearer, more detailed image that is better suited for tasks like object detection or classification.

Overall, this methodology leverages a combination of specialized image acquisition, pre-processing, and enhancement techniques to improve the quality and utility of underwater images. By carefully analyzing pixel values, converting to grayscale, applying noise reduction, and utilizing advanced enhancement methods like the HWD transform, the algorithm aims to produce high-quality images suitable for various underwater applications.

### III. CONCLUSION

The proposed HTIBF method is an underwater image enhancement technique which is normally used as a pre-processing method for object detection and recognition of underwater image. HTIBF method consists of integrated steps namely pre-processing, HWD transform, background removal, histogram mapping, wavelet fusion, and adaptive local histogram specification. With the aim of enhancing the image contrast and visibility, the proposed HTIBF provides a platform for image detection and recognition

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