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MATLAB BASED UNDERWATER AND SATELLITE IMAGE ENHANCEMENT USING AUTO THRESHOLD METHOD

Suryamani Singh*1 & Mrs. Priyanka Gaur[2]

[*1]M. Tech Scholar, E.C.E., Advanced Institute of Technology, and Management, AITM, Palwal
[2]Assistant Professor, E.C.E., Advanced Institute of Technology, and Management, AITM, Palwal

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ABSTRACT

In the field of image processing, Satellite imaging is one of the challenging tasks for the researchers. The different satellite sensors are available in the very low resolution to high resolution range for data collection. In this paper, a satellite image enhancement algorithm based on interpolation of the high-frequency subbands obtained by auto thresholding and the low resolution input image is proposed. This method uses a thresholding and high frequency subband image interpolation into the low resolution input images. The sharpness of image is obtained by the estimation high frequency subband. Inverse thresholding is performed to reconstruct the resultant image. The visual and mathematical results are presented and discussed on LANDSAT 8 data with comparison of proposed method over conventional and state of art resolution enhancement methods. 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.

I. INTRODUCTION

Acquiring clear images in underwater environments is an important issue in ocean engineering [1], [2]. The quality of underwater images plays a pivotal role in scientific missions such as monitoring sea life, taking census of populations, and assessing geological or biological environments. Capturing images underwater is challenging, mostly due to Water attenuates to light exponentially, due to light scattering and light absorption.

Fig. 1. This image is part of an underwater footage on the Youtube

So the images that are taken under the water has low contrast. Hence, the direction of light get changed and the quality of the images getting reduced. The scattering of light is further sub divided into forward scattering and backward scattering. Due to forward scattering the images are blurred and due to backward scattering the images limits with the contrast. In order to obtain underwater images with good quality, we need to study the propagation

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of light in water. When light travels in water the intensity of light losses exponentially, depending upon the wavelength of the color.

Most of the images that are taken under water appears blue-green since these components are absorbed last. So in order to increase the quality of the image that has low color and low contrast we have to work on computer vision application to increase the contrast of the image. The grayscale range I stretched using the nonlinear histogram stretching method, proposed by Yang [3]. The main drawback of yang's method is the image obtained when the method is applied to a low pixel valued image, the output image quality is very low. histogram of the RGB channel within a specific range, followed by Rayleigh distribution and the HSV colour model, where S and V components are customised. The method reduces the bluegreen effect, enhances the image contrast, and minimizes the under and over enhanced areas in the output image.

1.1 ABOUT THE PROJECT

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 enactment . 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 .The main objective of the my work is to implement good image enhancement. methods are able to enhance gray scale images. But depending on application they designed the enhancement method is different for different type of images.

1.2 The objective of the thesis work contains the following steps as described below:

1) To study the concept of enhancement .
2) To study of various existed image enhancement techniques by using MATLAB.
3) Study of how to improve image enhancement techniques .
4)To propose an algorithm to enhance the poor quality image to good quality images by increase the threshold .
5) Implement the concept in mat lab code

II. LITERATURE REVIEW

In recent years, contrast enhancement techniques have been used widely for analytical and diagnosis purposes. Image contrast enhancement which is based on the histogram modification methods has attracted significant attention from researchers due to its simplicity and computational efficiency [5]. A study proposed by [3] compared several enhancement algorithms based on Histogram Equalization (HE) such as Global Histogram Equalization (GHE), Local histogram equalization (LHE), Brightness preserving Dynamic Histogram equalization (BPDHE) and Adaptive Histogram Equalization (AHE). Similar to research by [6], a new enhancement technique namely Minimum Mean Brightness Error Bi-Histogram Equalization (MMBEBHE) has been proposed. This proposed method enhances any image based on a modified contrast stretching manipulation and simultaneously enhances the impulse noises presented in the images. The qualitative result of the proposed enhancement technique shows better performance among all comparison methods. However, there is no presence of information on the quantitative result.

A few methods have been proposed for the contrast enhancement of the FLAIR image intensity. A new method to enhance the contrast of WMLs in the FLAIR MRI images was proposed by [4]. The automated method has been developed to detect WMLs using enhanced intensity, anatomical and spatial feature-based random forest and Markov Random Field (MRF) [4]. As the study shows a promising result, it is recommended that the method is applied on a large scale of a longitudinal dataset.

Furthermore, the development of a novel contrast enhancement algorithm for FLAIR-weighted cerebral MRI with WML is proposed by [7]. The proposed method implements a robust estimate of edge magnitude and intensity values to discriminate between the pathological and nonpathological information of the image. Qualitatively, the technique has shown good performance where the results showed an average improvement of 41.1 %. There was no information regarding the quantitative result. Generally, T2-weighted imaging (T2-WI) sequence is highly significant for segmentation without requiring any specific enhancement technique. However, T2-WI comprising of high signal intensity in the cerebrospinal fluid (CSF) region may lead to the wrong classification of potential WMH in the segmentation process. Therefore, this study proposes a new enhancement technique for the FLAIR sequence based on the intensity of gray scale image. In this paper, a novel contrast enhancement method is

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presented to enhance the contrast of the FLAIR sequence of the MRI image. FLAIR images are known to have low contrast of gray scale intensity but they have unique properties for the WML analysis as the lesions are hyper-intense [7].

III. METHODOLOGY

I am using three steps, namely Exposure threshold calculation, histogram clipping and Histogram Sub Division and Equalization. The description of each step is presented in the following subsections

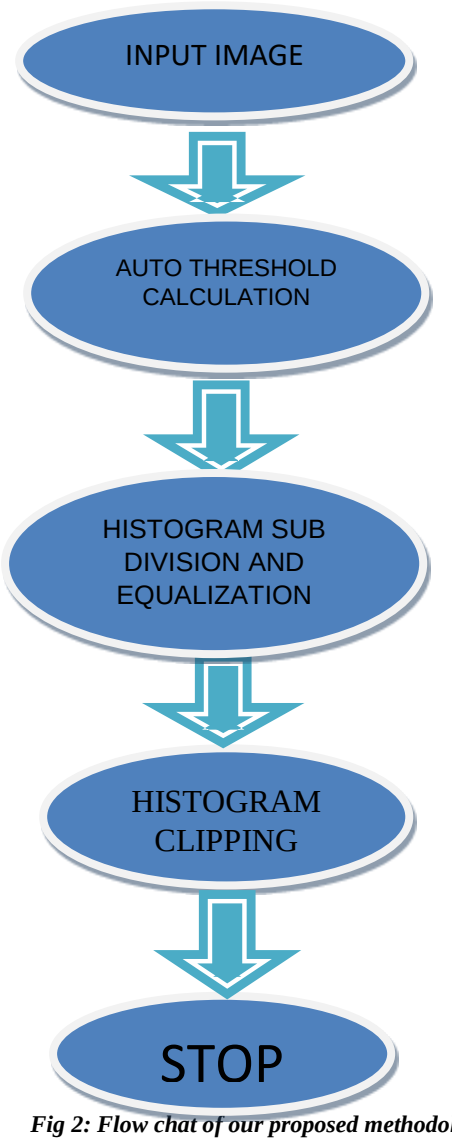

Fig 2: Flow chat of our proposed methodology

3.1 Auto threshold calculation

The normalized range of exposure value is 0–1. If the value of exposure for a particular image is more than 0.5 and tends toward 1, it means that the image has majority of overexposed region and if this value is less than 0.5 and tending toward 0 then image is containing majority of under exposed regions. In both cases image contains poor contrast and needs contrast enhancement.

3.2 Histogram clipping

For limiting the enhancement rate, we need to limit the first derivative of histogram or the histogram itself .The histogram bins having the value greater than the clipping threshold are limited to the threshold.

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3.3 Histogram Sub Division and Equalization

The original histogram is first bisected based on exposure threshold value Xa as calculated in .

IV. EXPERIMENTAL RESULTS

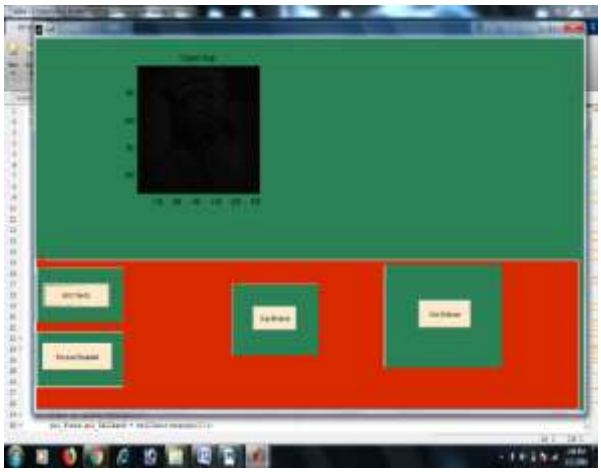

Fig 3:- main gui file with input images

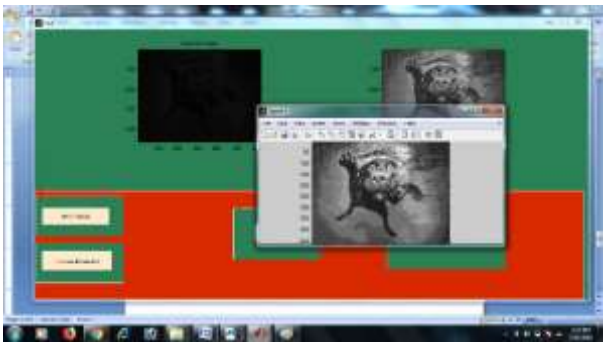

Fig 4:- underwater input and output images using auto threshold method

Fig 5 :- underwater fish input and output images using auto threshold method

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Fig 6 :- RGB input and output images .

V. CONCLUSION

This paper presents the satellite image enhancement technique based on the interpolation of high frequency subbands. The proposed technique decomposes an input image into four subband images, and interpolation is performed on the high-frequency subband images. Image enhancement techniques have variety of approaches for altering images to get desirable pictures. The review of Image enhancement techniques in Spatial domain and frequency domain have been successfully accomplished. Based on the type of image and type of noise with which it is corrupted, a slight change in individual method or combination of any methods further improves visual quality. In this paper, both spatial domain and frequency domain techniques and advantages and disadvantages have been emphasized . Most of the algorithms are useful for changing the gray values of individual pixels in an image and contrast is also changed of the whole image. The only limitation with image enhancement is they enhance the image in a uniform manner and as a result they give undesirable results. There are various techniques that have been developed till now for enhancement but still there is more requirement for enhancement which might be achieved by using artificial intelligence schemes for optimization that can produce satisfactory result. The future scope will be the development for effective image enhancement using artificial intelligence so that enhancement might be performed in balanced manner which would be able to provide promising directions on research for optimization

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