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Underwater Image Enhancement using Histogram Method

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Abstract

The underwater images not only offer an interesting sight, but also have a challenge to monitor marine species and underwater activities. Taking a beautiful underwater image requires extraordinary equipment and technique. Usually, there are distorted colors on the image caused by poor light and water quality. So it requires an image enhancement process to geta proper photo to display. This research offers an improved method of auto levels to produce stunning photos. This method uses the color balancing based on the distribution of each channel R, G and B based on its histogram. The balancing of colors will reproduce colors more attractive compared with other methods of auto level.

Keywords*: auto level, color balancing, underwater images, histogram*

1. Introduction

The Indonesia's ocean has beautiful scenery such as Bunaken on Manado and Raja Ampat on Papua but it's still not well explored caused by the poor visibility conditions the environment of underwater. To capture a good underwater image requires extraordinary equipment and special photography technique. There were still some beautiful underwater photographs, though many people captured it. Tomake good underwater images, we use a specific image enhancement technique. As light reflected from objects towards the camera, a portion of light meets these suspended particles, this will in turn absorb and scatters light [1]. [2] Proposed the simple algorithm to stretch R, G and B to maximal possible range [0,255]. It applies an affine transform a*x*+b to each channel [3] also propose the automatic stretch algorithm to enhance reporter's images. [4] have analyzed the error distribution of the predicted corresponding colors using the chromatic adaptation transform (CAT). Land use and land cover classification of LISS-III satellite image using KNN and decision tree is analyzed in [8]. Image Super Resolution Using Wavelet Transformation Based Genetic Algorithm is discussed for enhancing image compression efficiency [9].

Figure 1. Original Underwater Image

2. Proposed Method

The basic problem in the underwater image is low contrastin each color channel. The suggested solution is auto level that produces an image with maximum contrast. Thus the

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resulting image provides good underwater scenery. The simple block diagram of this research is shown in figure 4.

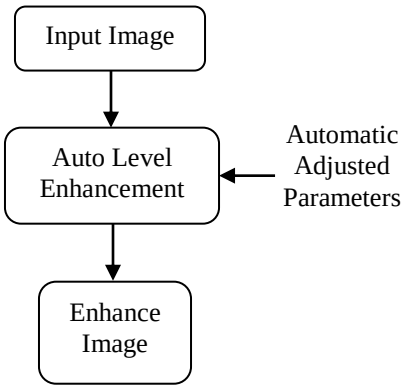

Figure 2. Block Diagram of the Proposed System

2.1. Auto Level

Auto level for color image using separated auto level process on each channel. The color image has three channels: Red, Green and Blue channel.

(a) (b)

Figure 3. (a) Original Image, (b) Auto level

2.2. Histogram Equalization

The other method to enhance underwater image is histogram equalization [5]. This method use cumulative distribution function on each channel. Iterative adaptive regularization method and genetic algorithm based Image super resolution reconstruction is presented [6]. Voice Codec with Silence Suppression on Wireless Ad Hoc Network is described with the performance analysis of Media Access Delay and throughput parameters [7].

Figure 4. Histogram Equalization Image

2.3. Improving Auto Level

The auto level method has a problem with boundary on leftand right side of histogram. In this area, there is a lot of small value that is not significant on visual.

Figure 5. Improved Auto level Image

3. Experimental Results

We use some underwater images that have poor color and contrast. We try three auto-level methods: basic auto level, improving auto level with constant distance moving and improving auto level with our proposed method. Our proposed methods produce the distribution that is closer with uniform distribution then the basic auto level methods. So, it can be said that the auto level process that occurs also include distribution equalization for each color channel

4. Conclusions

The underwater images have poor color and contrast. It needs the image enhancement process to make it look better. The good image enhancement for underwater images is auto level method. Auto level method increases the contrast of each color channel. Improving of auto level is needed for underwater images. Our proposed method uses the adjusted value to stretch the left and right boundary of image histogram based on its distribution. This method shows the significant improvement of auto level for underwater image. So, many objects on the underwater images look clearer.

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