www.ijiarec.com

ISSN:2348-2079

Volume-7 Issue-1

International Journal of Intellectual Advancements and Research in Engineering Computations

Underwater image enhancement using multi scale fusion

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ABSTRACT

Underwater images are suffered by several factors like colour absorption, light scattering, and these lead to poor visibility and low contrast of an underwater image. Typical image restoration methods rely on the popular Dark Channel Prior. However, the result of the underwater image which has only been dealt with the restoration algorithm is still not ideal. In order to get better results, we introduce a new underwater image enhancement approach based on multi-scale fusion strategy in this paper. In our method, we first obtain the restored image on the base of underwater image model. Then we get the white balance and contrast enhancement image of the restored image respectively. Finally, these two derived inputs are blended by multi-scale fusion approach, using saturation and contrast metrics to weight each input. This algorithm reduces the execution time and can effectively enhance the underwater image. The experimental results demonstrate that our method can obtain better visual quality.

Keywords: Multi Scale Fusion (MSF).

INTRODUCTION

Underwater environment offers many rare attractions such as marine animals and fishes, amazing landscape, and mysterious shipwrecks. Besides underwater photography, underwater imaging has also been an important source of interest in different branches of technology and scientific research, such as inspection of underwater infrastructures and cables, detection of manmade objects, control of underwater vehicles, marine biology research, and archaeology.

Different from common images, underwater images suffer from poor visibility resulting from the attenuation of the propagated light, mainly due to absorption and scattering effects. The absorption substantially reduces the light energy, while the scattering causes changes in the light propagation direction. They result in foggy appearance and contrast degradation, making distant objects misty. Practically, in common sea water images, the objects at a distance of more than 10 meters are almost unperceivable, and the colours are faded because their composing wavelengths are cut according to the water depth.There have been several attempts to restore and enhance the visibility of such degraded images. Since the deterioration of underwater scenes results from the combination of multiplicative and additive processes traditional enhancing techniques such as gamma correction, histogram equalization appear to be strongly limited for such a task. In the previous works that are surveyed in Section II.B, the problem has been tackled by tailored acquisition strategies using multiple images, specialized hardware or polarization filters. Despite of their valuable achievements, these strategies suffer from a number of issues that reduce their practical applicability.In contrast this paper introduces a novel approach to remove the

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haze in underwater images based on a single image captured with a conventional camera. As illustrated in Fig. 1, our approach builds on the fusion of multiple inputs, but derives the two inputs to combine by correcting the contrast and by sharpening a white-balanced version of a single native input image. The white balancing stage aims at removing the color cast induced by underwater light scattering, so as produce a natural appearance of the sub-sea images.The multi-scale implementation of the fusion process results in an artifact-free blending [1-5].

PROPOSED SYSTEM

Underwater images suffer from poor visibility resulting from the attenuation of the poor visibility, lack of contrast and colour casting mainly due to light absorption and scattering. In literature there are many algorithms aimed to enhance the quality of underwater images through different approaches. The main objective of our method is to remove the noise and increase the accuracy. The existing method has low accuracy. The proposed system is multi scale fusion which is used to improve the accuracy of images.

BLOCK DIAGRAM

The Figure 2.1 shows the block diagram of the proposed system.

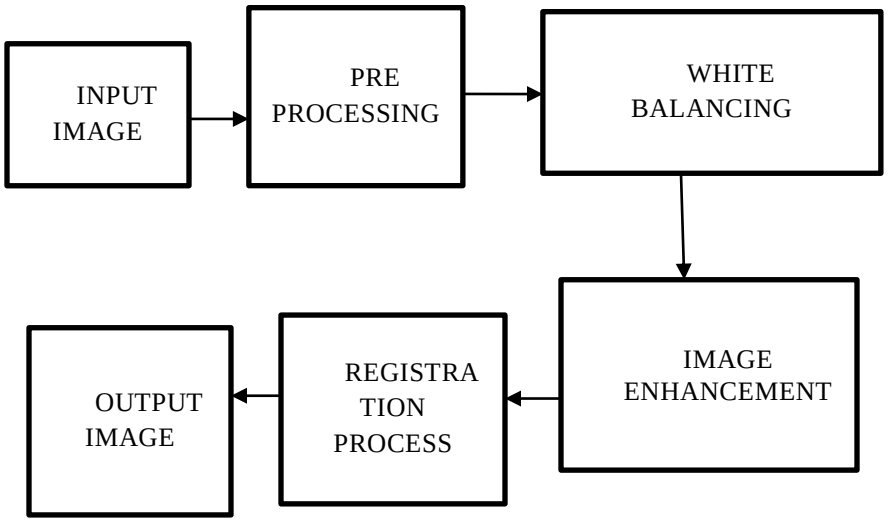

Figure 2.1 Block diagram

Pre Processing

Pre-processing literally means that after one algorithm is applied to the image, the output of that algorithm is fed to the input of some other algorithms, while an enhanced image should be the final result for a particular algorithm. Of course, an image enhancement algorithm can also have pre-processing steps, while an enhanced image can still be used as an input for other algorithms.

White Balancing

White-balancing aims at improving the image aspect, primarily by removing the undesired color castings due to various illumination or medium attenuation properties. In underwater, the perception of color is highly correlated with the depth, and an important problem is the green-bluish appearance that needs to be rectified. As the light penetrates the water, the attenuation process affects selectively the wavelength spectrum, thus affecting the intensity and the appearance of a colored surface (see Section II). Since the scattering attenuates more the long wavelengths than the short ones, the color perception is affected as we go down in deeper water [6-10].

MULTI SCALE FUSION

Since the color correction is critical in underwater, we first apply our white balancing

technique to the original image. This step aims at enhancing the image appearance by discarding unwanted color casts caused by various illuminants. In water deeper than 30 ft, white balancing suffers from noticeable effects since the absorbed colors are difficult to be recovered. As a result, to obtain our first input we perform a gamma correction of the white balanced image version. Gamma correction aims at correcting the global contrast and is relevant since, in general, white balanced underwater images tend to appear too bright.

SOFTWARE SIMULATION

Matlab

MATLAB is a multi-paradigm numerical computing environment and proprietary programming language developed by Math Works. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages,including C, C++, C#, Java, Fortran and Python. Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing abilities. An additional package, Simulink, adds graphical multi-domain simulation and model-based design for dynamic and embedded systems.

Simulation results

We have simulated the paper in matlab which is one of best software for electronic design

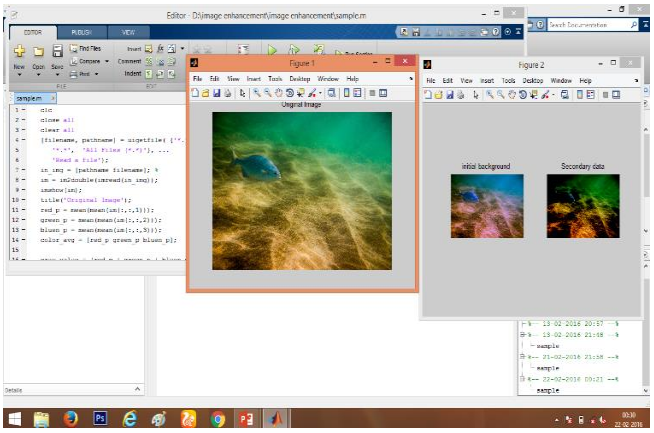

Figure 4.1 Simulation Results

CONCLUSION AND FEATURE WORK

We have presented an alternative approach to enhance underwater videos and images. Our strategy builds on the fusion principle and does not require additional information than the single original image. We have shown in our experiments that our approach is able to enhance a wide range of underwater images (e.g. different cameras, depths, light conditions) with high accuracy, being able to recover important faded features and edges. Moreover, for the first time, we demonstrate the utility and relevance of the proposed image enhancement technique for several challenging underwater computer vision applications.

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