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# Deep Underwater Image Enhancement through Integration of Red Color Correction Based On Blue Color Channel and Global Contrast Stretching

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**Abstract.** Deep underwater images experience some complicated problems, such as low contrast and blue-green illumination effect due to light attenuation in water medium. These problems reduce the extraction rate of valuable information from the image. This paper proposes a new method of enhancing underwater image. The proposed method consists of two major steps. The first step is explicitly designed to minimize the effect of blue-green illumination. This technique operates by correcting the red color channel by taking into account the differences between the red color with blue color in term of total pixel value. The more significant the difference of total pixel value between these colors, the higher the pixel value will be added to improve the red color and vice versa. Then, the overall image contrast is improved through global contrast stretching technique that is applied to all color channels. Qualitative and quantitative evaluations prove the effectiveness of the proposed method.

**Keywords:** Image Processing, Red Color Correction, Contrast Stretching.

## 1 Introduction

Deep underwater images usually have high concentrations of blue-green illumination that cause difficulty in viewing and analyzing objects on the seafloor. This phenomenon occurs because of the light spectrum moving in the water medium is absorbed. This absorption depends on the wavelength where the red color is absorbed earlier than blue and green colors [1]. This causes the underwater image looks bluish and greenish. In addition, the backward scattering is a phenomenon where the portion of light has been reflected by the particles found in the water towards the camera [2]. This incident reduces the image contrast which deteriorates the quality of underwater image.

This paper explains a proposed method that enhances the visibility of deep underwater images. It integrates two main steps, which are red color correction based on blue color channel (RCCB) and global contrast stretching (GCS). Therefore, this proposed method is termed as RCCB-GCS. Qualitative and quantitative evaluations prove the effectiveness of the proposed RCCB-GCS method.