A SIMPLE WAY OF DECREASING THE AMOUNT OF PHOTO/VIDEO DATA WHILE TRANSMITTING VIA UNDERWATER COMMUNICATION SYSTEMS

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Nowadays, it is problematic to stream video under the water. Underwater communication systems do not allow for the rapid transfer of large amounts of data. In this paper, we consider a simple way to reduce the amount of information by at least 33% and prove the effectiveness of this method.

Nowadays, autonomous underwater uninhabited vehicles (AUVs) are used to conduct scientific research in the world ocean. For their communication and navigation, it is not reasonable to use electromagnetic waves due to their rapid attenuation. Transmission of information using light pulses is not possible over long distances due to the short range of propagation of a light beam in the sea or freshwater; in addition, this method is associated with a large number of side difficulties, such as the orientation of the transmitter relative to the receiver.

Consequently, hydroacoustic waves are used to provide underwater communications and navigation for AUVs, which can propagate over long distances. However, the use of this method of signal transmission is fraught with numerous difficulties, such as the Doppler effect, reverberation, narrow bandwidth, which makes it impossible to achieve a high data transmission rate, balancing it with different methods of density compaction, the use of high-ranking manipulation methods, compression procedures, etc.

Under certain conditions, it may be necessary to transmit a video stream in real-time for control of the vehicle and provide a visual estimation of the seabed topography and its video recording. However, the bandwidth for transmitting video is not enough. Therefore, various compression methods are used.

As is known, when entering the water, electromagnetic waves of the optical spectrum have different penetrating power depending on the chemical composition fluid and on its state of the environment. Nevertheless, the regularity is obvious: the power of the long-wave part of the spectrum decreases much faster than the short-wave part.

The Byron pattern applied to the matrix of a video camera consists of green, blue, and red colors. Based on the foregoing, an assumption arises that if we reset all the bits responsible for red, removing them from their total stream, the quality of the photo or video will deteriorate minimally, while maintaining the contrast at the proper level, reducing the amount of transmitted data by at least 33 percent.

To confirm this theory, for several underwater pictures with different color schemes, the bits responsible for the red component were reset to zero, the results are presented in Figure 1.

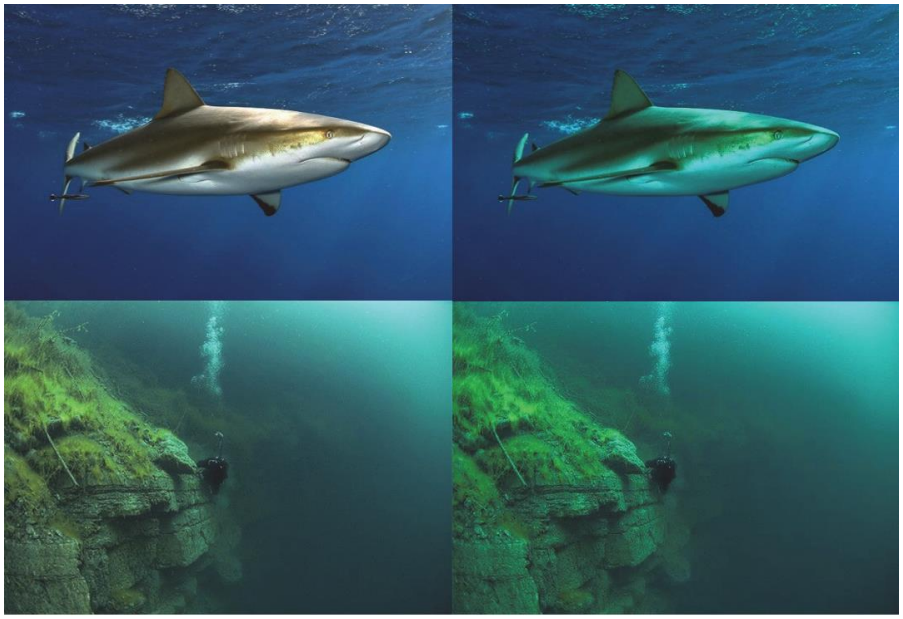

Figure 1 - Reference image and converted

The red component of images in the underwater environment is negligible. That is why the photo, exactly like the video recording, freed from the red component, is minimally distorted. In the above examples, it is noticeable that the image does not lose contrast at all, all its elements are clearly visible and accurately defined by the human eye.

Thus, the complete removal of the red component minimally distorts the image, making it possible to reduce the amount of transmitted data by at least three times. In combination with mathematical methods of compression, this method can be quite effective for transmission in a hydroacoustic communication channel with a narrow frequency.

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