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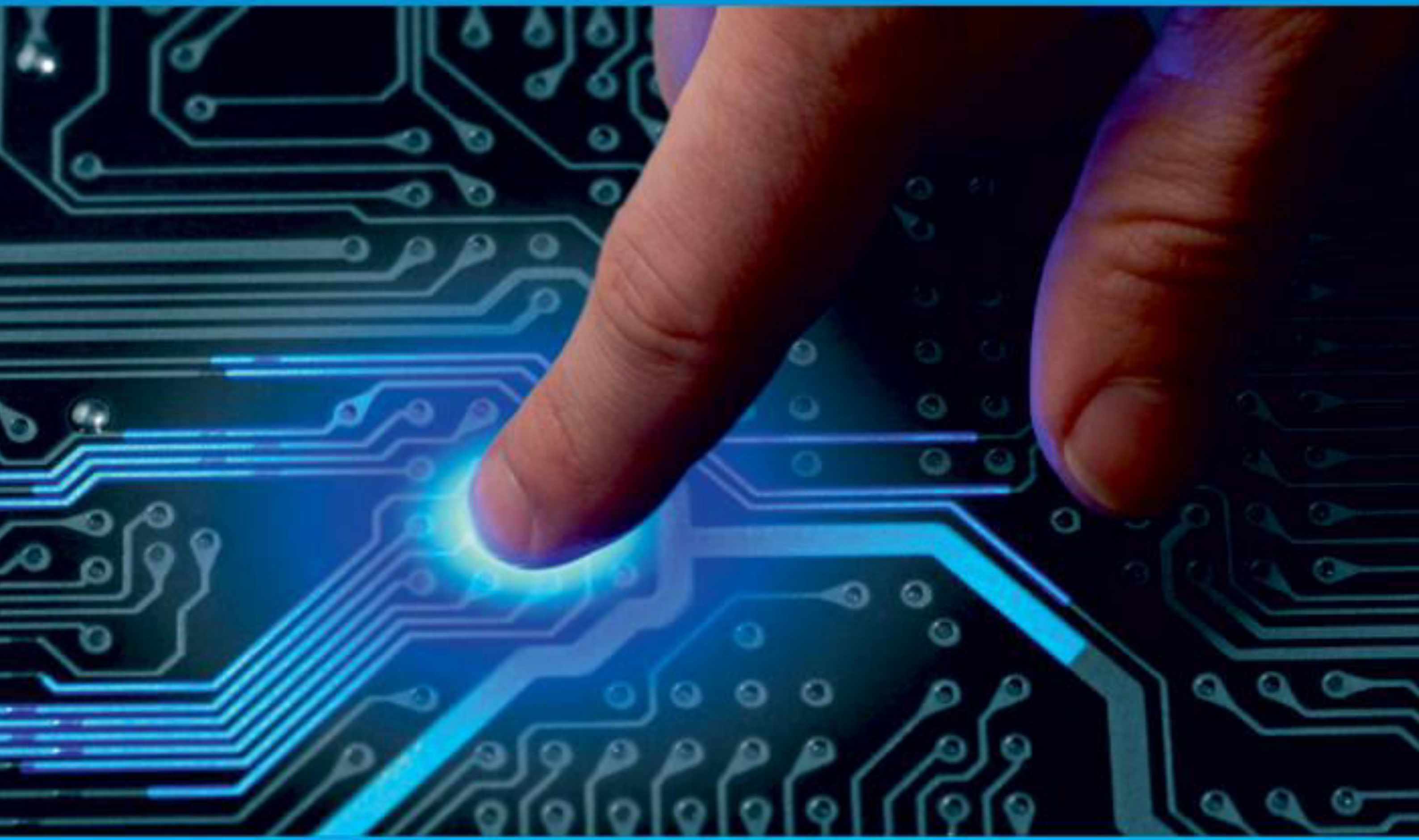

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Image Transmission through Water Molecules

Lokeshkumar V , MukeshKumar.D , Dr.M.V.Karthikeyan, M.E., Ph.D.

UG Students, Dept. of E.C.E., St.Joseph's Institute of Technology, Chennai, India

Associate Professor, Dept. of E.C.E., St.Joseph's Institute of Technology, Chennai, India

ABSTRACT: Water data communication is a potential technology to realize underwater communication. The experiment of underwater data communication in the laboratory is different with that in the real water environment because the physical scale is limited. Although since recent several decades, artificial scattering agents are used to recreate underwater data communication through water channels under different communication medium conditions, but the similarity between experimental water and natural water is not reliable, such as the similarity in frequency domain characteristics.

KEYWORDS: Water communication.

I. INTRODUCTION

Underwater image processing has gained a lot of interest these days, as Researchers have shown great interest in exploring underwater in order to gain greater knowledge on underwater species, landscape, plants etc. But the images obtained from under water are not clear due to dust particles that float under water and inability of light to propagate through water in-depth. Water attenuates to light exponentially, due to light scattering and light absorption. 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 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. Iqbal makes use of histogram modification technique in [1,2] to enhance the quality of underwater image. ICM and UCM techniques creates good output of underwater image by increasing the contrast of the image. So the objects appear more clearly than in original. But the disadvantage is the output images has blue-green illumination. The ICM and UCM produces more noise in the output image. Noise of a image represents an unwanted data that embedded with the pixel. 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. The author in has initially applied the image to modified Von Kries hypothesis and the image is stretched into two different intensities at the average value with respects to Rayleigh distribution. The image is converted into huesaturation-value (HSV) colour model to colour correct the image. Contrast is but not much improvement is seen in the blue-green illumination of the images. The authors of have stretched the 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. As C. Tomasi claims the edges of underwater images are smoothened using the bilateral filter. Bilateral filters in general are simple, local and non-iterative. It's very tough to understand and analyze a bilateral filter owing to its non-linear feature. In order to avoid over smoothing of structures in the images narrow spatial window are used, which leads to performing more number of iterations in the process. Besides the trilateral filter evens out the edges of the structure in the image. The joint trilateral filter can remove the overly dark fields of the underwater images by refining the transmission depth map through trilateral filtered source image and estimated transmission depth map. In author kunal Narayan has used bilateral filter for enhancing images and has claimed, that the output obtained has better speed and is artefact free. In author Huimin Lu, et al., has used guided trigonometric bilateral filtering for image enhancement. Weighted guided trigonometric bilateral filter has the benefits of edge-preserving, noise removing, and a reduction in the computation time. In order to overcome the above mentioned problems and to enhance the underwater image two methods have been proposed. The first method is Linear image Interpolation (LimI) and the second is Limited Image Enhancer(LIE). The underwater image enhancement is done in two modules. The first module uses filters to remove the distortion and the second

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module enhances the obtained underwater image by using the algorithms to increase the resolution and increase the contrast respectively.
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II. RELATED WORK

In 2021,Yue Rong,Sven Nordholm, Alec Duncan proposed that on the Capacity of Underwater Optical Wireless Communication Systems. In this paper, we first analyze the factors that affect the capacity of underwater optical wireless communication (UOWC) systems through deriving a new tight capacity upperbound. We find that the system capacity depends on the light wavelength in a complicated manner. Then we compare UOWC with the underwater acoustic communication (UAC) technology in terms of channel capacity, communication range, and energy efficiency. We show that UOWC requires a much lower energy-per-bit than UAC for short range communication. Finally, we study the multi-hop communication technique to extend the range of UOWC. The optimal number of hops is derived taking into account the cost of deploying relay nodes. Our study provides useful guidelines in designing a hybrid underwater acoustic/optical communication system which can achieve an increased range-rate product for underwater wireless communication.In 2021, Thomas Scholzproposed a system laser based underwater communication experiments in the baltic sea.While underwater acoustic communication offers a wide range of applications for command and control links, it is restricted in data rate. When transferring huge amounts of information in underwater networks, e.g. between surface and underwater vehicles or other platforms, the additional use of optical communication techniques can be advantageous.Underwater optical communication is studied at WTD 71 on the basis of a laser communication system using a robust two channel approach with orthogonal polarized laser beams. After the first experiment in a harbor basin 2016, a sea trial was performed October 2017 in the Baltic Sea to analyze system performance and channel characteristics in more detail.

III. PROPOSED METHOD

In this project, several kinds of agents are evaluated to change the coefficients of experimental water precisely. Then, seemed as criterion for the reliability of water recreation, the frequency domain characteristic of Image communication through water channel in experimental water is measured and compared. The results show that the water communication is done by wireless. It is image transmission by having a separate TX and RX module in the water between the modules we can transmit the sea researchers interactions to the monitoring end available on the ship.

Block Diagram

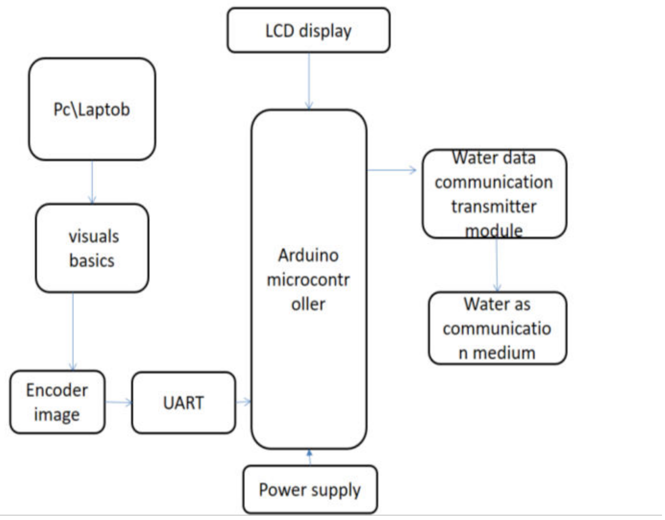

Fig .1.TRANSMISSION

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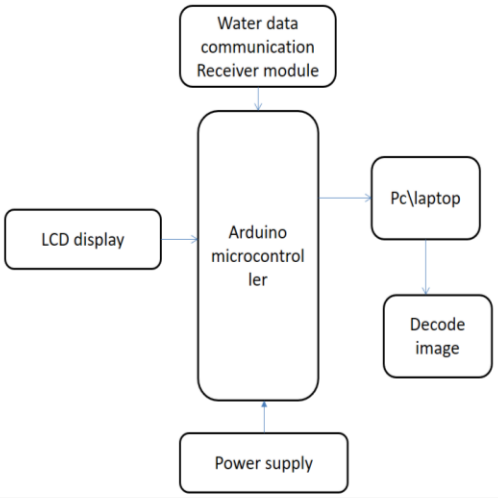

Fig.2.RECEIVER

IV. RESULTS

This system is developed to communicate underwater. Underwater wireless communications play an important role in marine activities such as environmental monitoring, underwater exploration, and scientific data collection.Underwater wireless communications still remain quite challenging, due to the unique and harsh conditions that characterize underwater channels.

Fig.3. kit diagram

Transmission and reception of the image snippets works well when the underwater c communications channel is good for communications at 25 kHz. Not surprisingly, on days with high underwater ambient from winds and or motions of the micromodem in a sea state, packet loss occurs. The actual range for good fidelity reconstruction of images depends again on the condition of the local underwater channel.

V. CONCLUSION AND FUTURE WORK

The results presented indicate that networks based on underwater wireless links are feasible at high data rates for medium distances, up to a hundred meters. Such networks could serve subsea wireless mobile users. In addition, by placing multiple relay nodes between the chief network nodes, messages could traverse very long distances despite severe medium-induced limitations on the transmission ranges of individual links. Additional improvements to the availability of the network could be achieved by a hybrid communication system that would include an optical transceiver and an acoustical transceiver. A hybrid communication system can provide high-data rate transmission by using the optical transceiver. When the water turbidity is high or the distance between the terminals is large, the system can switch to a low data rate using the acoustic transceiver, thereby increasing the average data rate and availability.

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However, the complexity and cost of the system are increased. In this kind of system, smart buffering and prioritization could help to mitigate short-term data rate reduction. Many aspects of the proposed system remain to be investigated .Extensive studies should be made of the nature of multiple scattering in different oceanic channels.

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