International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 04 | Apr 2021 www.irjet.net p-ISSN: 2395-0072

IR UNDERWATER WIRELESS COMMUNICATION

Dr. P N SUDHA[1], H G SRINIDHI[2], ABHISHEK K V[3], ANUSHRI V K[4], BHOOMIKA P K[5]

[1]HOD, Dept. of ECE, KSIT, Karnataka, India.
[2,3,4,5]Student, Dept. of ECE, KSIT, Karnataka, India.

Abstract - *Underwater wireless communication is one of the major challenges faced in the field of technology. Underwater wireless information transfer is of great interest as there's a rise in number of vehicles and devices deployed there, which require high bandwidth and thus high capacity for information transfer .It was proposed and has received maximum attention in the last decade. Successive progress has been made in this field but there has been a simultaneous limitation as well, as a result of which acoustics was replaced by infrared waves (IR).*

The signal that is pulsed is passed through the modulation circuit and is provided to the light emitting diode that transmits pulsed burst of IR radiation to light sending diode within the second communication module.. Subsequently, an appropriate approach is selected for the communication with minimum loss and maximum distance. This paper puts forward an effective way of secured under water communication.

***Key Words*: wireless communication, underwater communication, secured IR waves.**

1. INTRODUCTION

The method of sending and receiving the message by using the electromagnetic waves in the underwater environment is called as underwater wireless communication. Traditionally communication cables are laid on the sea beds for the purpose of underwater communication, but the biggest challenge of this approach is that its service is vulnerable to many parts of the world because of lack of redundancy.

Till date, underwater communications and data transmission systems have been among one of these three major types. The first one includes a metal wire electrical connector that exists between a transmission and the reception unit. The drawback with the hard wired system is that the rigors of the underwater environment will frequently break the electrical connector, especially when they are at longer distances and greater depths. The next type uses acoustic transmission components such as sonar which allows for underwater communication for short range.

The major problem here is the intelligibility of the transmission is very low due to the Presence of noises and thermocline echoes that are generated in the underwater environment.

Softhead third type is the one where the system utilizes the body of water as a conductor for the electric field transmission. This type is generally an improvement over the other two systems because they are relatively immune to the noises and the stress present in the underwater environment. However, these systems often need complex circuits to transfer information, they are expensive and also have bulky packaged containers because of which they cannot be used by divers. Henceforth, there is a need for an improved underwater communication system that is cost efficient, is easy to transport and will provide reliable communications in the undue conditions associated with an underwater environment. The current invention overcomes some of the disadvantages, including those mentioned above. It comprises of an efficient yet relatively simple communications system for use in an underwater environment. The underwater IR (infrared) communications system of the current invention consists of first and second underwater communications modules which transmit and receive data utilizing IR radiation .This technique has wide range of applications like aquatic surveillance, underwater pollution discovery, archeological underwater survey, and submarine communications and so on.

Coming to underwater wired communication the cost estimate varies depending on the length of the cable and hence may vary anywhere between $100million-$500million.Natural disasters like mudslides, typhoons etc. act as another threat to the under-water fibers. Also since the depth of the sea bed varies the depth at which the cables have to be installed also keeps varying as a result of which the maintenance cost increases and this adds on to another drawback of using wired communication underwater. From the above explanations it is important to consider the factors such as implementation costs, target data output for the prescribed range and also the transmission power which lead to environmental impacts such as the interference with the marine life.

In this paper we will discuss about the important features of wireless underwater communication technology. It also

discusses about how IR can be used to provide possible solutions to the current challenges in order to improve the data communication in the underwater environment.

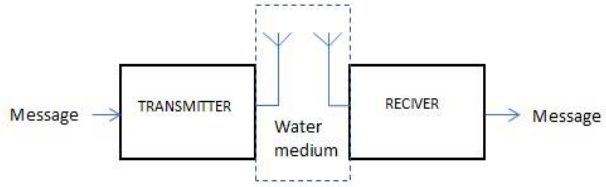

Fig-1:Basic block diagram .

2. LITERATURE REVIEW

Optical communication based system will have the high propagation speed .But suspended particle in water causes back scattering and hence there are affected by the turbidity of the water.

Acoustic waves are less sensitive to the suspended fine particles with in water and turbidity than the optical waves. They are the most used methods due to their ability to reach long distances. However it has some main drawbacks, like low data rate. That data rate is limited by strong reflections and attenuations as well as poor performance in turbid water with large particles, salinity and environmental sensitivity.

Khalid Mahmoud Awan, et al [1] this paper describes the Underwater sensor network has a number of vehicles and sensors that are deployed in a specific area to perform collaborative monitoring and data collection tasks. Traditionally for the monitoring of ocean bottom, oceanographic sensors are deployed for recording data at a fixed location and recover the instruments at the completion of task. The major disadvantage of this approach is lack of interactive communication between different ends .Major challenges for the design of acoustic network are spectrum sensing, dynamic power control, spectrum sensing strategy, etc. Therefore, routing and media access control protocols need to be designed by taking his care of maximizing the channel utilization.

Abhishek Sharma,et al [2] this paper deals with monitoring different activities in an underwater environment. Due to these reasons, under-water wireless communication has become a significant field. Optical, acoustic and electromagnetic waves are widely used for data transmission. Investigation of possible techniques has a huge impact on wireless communications. Nowadays, this system is being used for experimental observation, , oceanographic data collection and analysis, underwater navigation, disaster prevention and early detection warning of a tsunami.

Mr. Velu Aiyyasamy,et al [3] this paper states that underwater wireless data transmission is of great interest as there is a rise in number of devices deployed underwater, that require a very high bandwidth and thus high capacity for data transmission. Several advancements have been made in this field using acoustics but it has limited bandwidth. Electromagnetic waves are an alternative to acoustics. These waves, within the radio frequency range, are a suitable option for underwater wireless communication when used for high rate transfer over a short range of distance.

Muhammad Tahir, [4] this paper focuses on physical properties that can be observed via electromagnetic radiations which include the following: ocean surface wind stress, surface wave spectra, sea surface topography, sea surface temperature, and sea ice cover,etc. It also deals with the challenges face by electromagnetic waves in underwater environment which includes, Interaction of radio frequency with sea surfaces, emission of radio and microwave energy from the sea surface.

The demand for security of underwater communication is growing tremendously. Especially for the defense application purpose, the secrecy of the data has to be maintained. In order to achieve this suitable algorithm has to be implemented. And hence we make use of cryptography techniques to encrypt the data and prevent information leakage. The technique used in this paper is RSA algorithm. This algorithm is easy to implement and it is secure. RSA is an asymmetric type of encryption. The RSA This algorithm can be implemented using c language or python and fed to the aurdino or to the raspberrypi.

3. PROCEDURE AND METHODOLOGY

Transmission block:

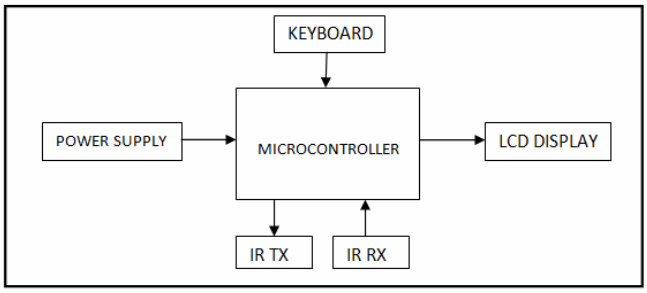

Fig-3.1: Transmission block

Receiving block:

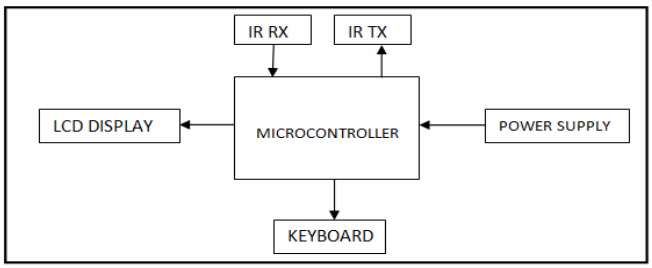

Fig-3.2: Receiving block

In this paper we focus on IR communication using keyboard for the purpose of input and has two units that are controlled by a microcontroller. Both the units have IR trans-receivers as the communicating agents. Keyboards are connected on both the ends.16x2 LCD is connected to the system where the communication messages get displayed. The system communicates with confirmation key that is sent back by the receiving unit to the transmitting unit. In this way wireless communication is implemented with great efficiency within a line of sight range of about 3-4 meters underwater with the help of IR communication.

4. ADVANTAGES

- IR transmission can operate with a very minimal power.
- High data rate can be achieved with a minimum propagation loss.
- It is a secured way to transfer the data between the devices in the underwater environment because the signal cannot pass through a room or a chamber.
- Wired communication entails the use of connection wires. In wireless IR networks, communication does not require elaborate physical infrastructure or maintenance practices. Hence the cost is reduced.

5. CONCLUSION

Despite of much development in this area of underwater wireless communication, there is still an immense scope so more research as major part of ocean bottom yet remains unexploded. The main objective is to overcome the present limitations and implement advanced technology for oceanographic research and cope up with the environmental effects on the performance of the underwater wireless communication systems to compete with the future challenges by the effective transmission of audio and video signals etc. Also the above proposed system seems feasible in order to achieve high data rate transmission with low propagation delay as far as short distance communication is concerned. When low frequency signals are used even if the communication range is more the major disadvantage is that the data rate collapses thus leading to a greater propagation delay.

REFERENCES

[1] Khalil Mahmood Awan, Peer Azmat Shah, Khalid Iqbal, Saira Gillani, Waqas Ahmad, Yunyoung Nam,"Underwater Wireless Sensor Networks :A Review of Recent Issues And Challenges", January 01,2019. *

[2] Mohammad Furqan Ali, Dushantha Nalin K. Jayakody , Tharindu D. Ponnimbaduge Perera, Kathiravan Srinivasan, Abhishek Sharma and Ioannis Krikidis, "Underwater Communications:Recent Advanvces",March 2019.

[3] Mr. Velu Aiyyasamy, K Rengarajan, Sayed Mohamed Ejaz P, SS Vijayasarathy,"Underwater Wireless Communication Using Visible Light",vol:07 Issue: 03 | Mar 2020.

[4] Muhammad Tahir, "Underwater Wireless Communication Using EM Waves", October 19, 2020.

[5] Giuseppe Schirripa Spagnolo, Lorenzo Cozzella,Fabio Leccese,"Underwater Optical Wireless Communication",April 16, 2020

[6] Camila M. G. Gussen, Paulo S. R. Diniz, Marcello L. R. de Campos, Wallace Martins,"A Survey Of Underwater Wireless Communication Techniques",January 2016

[7] Guenther Knapp,"Underwater IR Communication System",December 04,1990.

[8] Davide Anguita, Davide Brizzolara, Giancarlo Parodi," Building an Underwater Wireless Sensor Network based on Optical Communication: Research Challenges and Current Results".

[9] Mengying Jiang,Jingting Li, Lin Gao, Yiwen Wan,"Simple Underwater Wireless Communication System",2011

[10] Hemani Kaushal and Georges Kaddoum,"Underwater Optical Wireless Communication", April 11,2016

BIOGRAPHIES

H G SRINIDHI
Student, Dept. of ECE,
K S INSTITUTE OF TECHNOLOGY
Bangalore.

ABHISHEK K V
Student, Dept. of ECE,
K S INSTITUTE OF TECHNOLOGY
Bangalore.

ANUSHRI V K
Student, Dept. of ECE,
K S INSTITUTE OF TECHNOLOGY
Bangalore.

BHOOMIKA P K
Student, Dept. of ECE,
K S INSTITUTE OF TECHNOLOGY
Bangalore.