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IR WIRELESS COMMUNICATION SYSTEM THROUGH WATER

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Abstract: Underwater wireless communication system makes use of two communication modules which transmits and receives data using infrared radiation. Each module consists of both transmitter and receiver which transmits and convert received data. Wireless infrared (IR) communication system is meant to use free space propagation of light waves as a transmission medium in near infrared band This system has many advantages such as is an inexpensive and the transmitter or receiver can be showed to another location with least distraction.This system is used for easy communication with transmitter and receiver in underground water.The system consist of acknowledgement receipt message that sent back from receiving circuit to the transmitting circuit on the message receipt. This allows for efficient communication between two circuits wirelessly this paper puts forward an effective way of secured under water communication.

Keywords : wirelesscommunication, underwater communication ,IR waves

1. INTRODUCTION

The method of transmitting and receiving the information by using electromagnetic radiation in the underwater environment without the use of wire or optical fibers is called underwater wireless communication . the electromagnetic spectrum orders electromagnetic energy according to wavelength or frequency, the electromagnetic spectrum ranged from energy waves having Extremely Low Frequency(ELF) to energy waves having much higher frequency,
Examples:- x-rays,microwaves,ultraviolet(UV),gamma rays. Traditionally optical fibers,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.
Infrared is an electromagnetic radiation has a wavelength longer than that of visible light but shorter than radio waves and has wavelength between (750 nm-1mm) .
Till the date data large metallic wires are placed between the transmitter and receiver in order achieve the communication between two devices .The main drawback of this method is they are 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 other technology which is used for underwater communication is acoustic transmission components such as sonar which allows for underwater communication for short range.
The major disadvantages in the above mentioned methods are the transmission rate is slow because of the presence of noise thermocline echoes that are generated in the underwater environment.The above mentioned disadvantages can be solved by the use 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, archaeological underwater survey, and submarine communications and so on.
Coming to underwater communication system using optical fiber it is very expensive to be built and it would be difficult to repair it for 12 months a year.the cost
estimate varies depending on the length of the cable and hence may vary anywhere between $100million-
$700million. For example to build the 24-Tbit/s
Capacity Arctic Fibre network is $620 million . Arctic
Fibre is working to rise $220 million in equity funding from various investors for cable with 80 wavelengths at 100G.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
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
This paper discuss the important features of underwater communication system with the use of

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Infrared(IR) radiation and provide the possible solution for the current challenges in order to improve the data communication in underwater.

Fig 1 .communication between research submarine

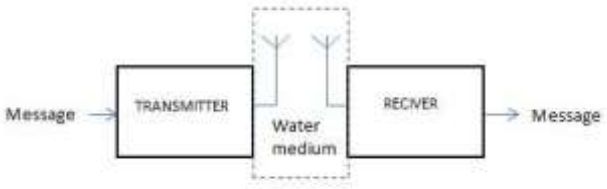
2. LITERATURE REVIEW

Optical fiber communication offers low power loss.
Which allows for longer transmission distances in comparison to copper ,in a network the longest recommended copper distance is 100m while with fiber it is 2km. 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.

- Abhishek Sharma,et al [1] 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.
- Muhammad Tahir, [2] 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.

3. METHODOLOGY

Basic block diagram:-



The Hardware Specifications used are
Power Supply, Rectifier, Regulator, LCD Display
8051 Microcontroller, IR Led,TSOP1738
Computer keyboard, Resistors, Capacitors, Diodes, Arduino Uno

- 8051 MICROCONTROLLER

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The microcontroller is one kind of integrated circuit that includes 40-pins with dual inline package or DIP, RAM-requirement, it includes addressable & programmable 4 – parallel 8-bit ports. In the 8051 microcontroller architecture, the system bus plays a key role to connect all the devices to the central processing unit. This bus includes a data bus- an 8-bit, an address bus-16-bit & bus control signals. Other devices can also be interfaced throughout the system bus like ports, memory, interrupt control, serial interface, the CPU, timers

- **TSOP 1738**

TSOP1738 is an IR receiver with an amplifier that acts as a switch and converter within a circuit. It has one input and output which only acts on the base of the input IR signal. The basic purpose of TSOP1738 is to convert the IR signal to electric signals. Every IR receiver has a special frequency to operate. TSOP1738 operates on 38KHz IR frequency. In case of higher or lower frequency, it may act due to a current leakage or some other errors but it won't fully operate. It uses silicon-based technology, which works at the microlevel and very sensitive and efficient to its functions

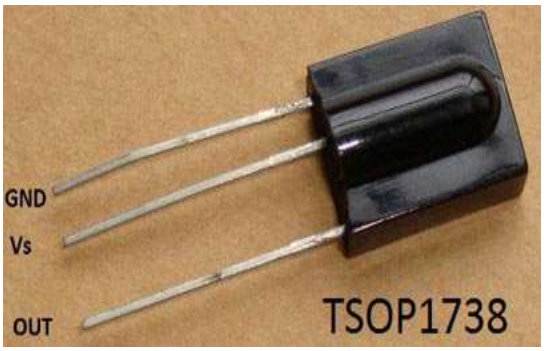


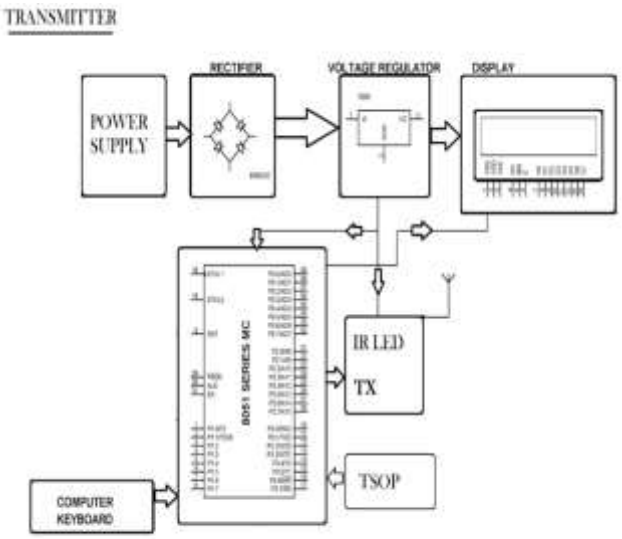
Fig. 2 TSOP1738

- **IR LED TX**

An IR LED (**infrared light emitting diode**) is a solid state lighting (SSL) device that emits light in the infrared range of the electromagnetic radiation spectrum. IR LEDs allow for cheap, efficient production of infrared light, which is electromagnetic radiation in the 700 nm to 1mm range.

BLOCK DIAGRAM:-

- TRANSMITTER:-



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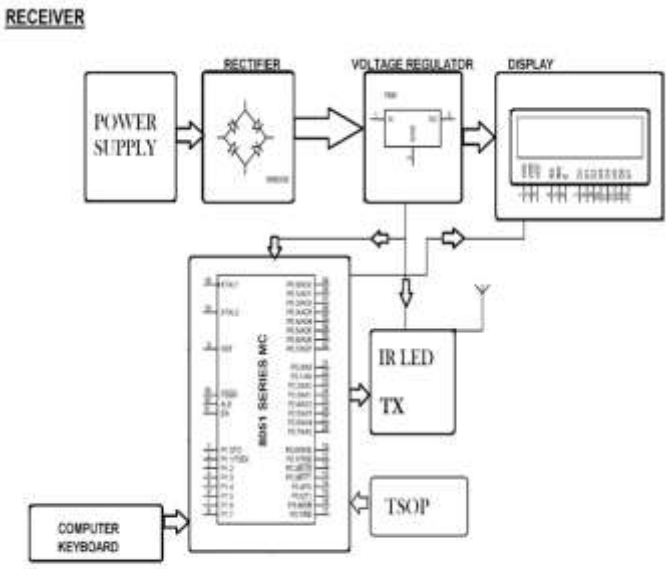

- RECEIVER:-

4. PROCEDURE

Here we propose an IR based underwater communication system that can be used for wireless communication of messages even through water. The system can prove to be a very cheap alternative to long heavy physical wires that run through seas, rivers and require large costs for laying those wires and their maintenance. Our system makes use of infrared transmitter receiver in order to achieve this system. Our system consists of two microcontroller based circuits that have IR transmitter-receiver pairs as well as LCD displays for displaying the messages. Each system has a keyboard connected to it in order to type in messages. We use two water barrels in order to demonstrate underwater communication using ir signals passing through those containers. The system also has an acknowledgement receipt message that is sent back from the receiving circuit to the transmitting circuit on message receipt. This allows for efficient communication between two circuits wirelessly

5. ADAVANTAGES

- 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

6. RESULT

- Our system can transmit and receive the messages through the underwater
- The system can prove to be a very cheap alternative to long heavy physical wires that run through seas, rivers and require large costs for laying those wires and their maintenance
-

7. 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

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