IR Wireless Underwater Communication System

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ABSTRACT

Underwater wireless communication plays an important role in marine activities like underwater explorations and resource management. The persons like divers working underwater are exposed to hazardous conditions that can affect their health. So, continuous monitoring of their health parameters is essential so that an important feature is included to monitor the health condition of the sea navigator while navigating the sea. This enables effective communication between the navigator and his monitoring team. The underwater wireless communication system comprises of two communication modules one for transmission and the other for reception of data using infrared radiation. This proposed system demonstrates the effective way of underwater communication and also ensures the health condition of the navigator and other personnel involved in difficulties rain water operations.

KEYWORDS: Explorations, Monitoring, Navigating, Communication, Infrared

1. INTRODUCTION

In Wireless communication allows information to be transmitted between two devices without using wire or cable. The data is being transmitted and received using electromagnetic radiation, 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, E.g., x-rays. Infrared is an electromagnetic radiation has a wavelength longer than that of visible light but shorter than radio waves and has wavelength between (750nm-1mm) Infrared LEDS are classified into Near Infrared (NIR) and Far Infrared (FIR). IR communication system consists of three main parts transmitter circuit, medium propagation (IR) and receiver circuit.[1] In this project, short distance transmission of signal is Realized by the design and achievement of infrared communication link.

2. WORKINGOFTHESYSTEM

The system consists of infrared transmitter and receiver for communication. It consists of two Arduino based circuits that have IR transmitter and receiver pairs as well as LCD display units for displaying the messages. [2]Each system has a key pad connected to it in order to type in messages. Whenever the sea navigator wants to send a message to the monitoring team, he/she can type a message with the help of keypad and the message taken as input of the Arduino nano then the

electrical signal data is converted into the optical data then by the IR transmitter. It emits the light in infrared range of the electromagnetic spectrum. The data is transmitted from transmitter to receiver through the water as medium and it is converted from IR signal to electrical signal by using the TSOP1738 receiver.

The microcontroller is used at the receiver side to receive the data by the system bus and the output of the microcontroller is given to the LCD display. The system also has an acknowledgement receipt message that is sent back the receiving circuit to the transmitting circuit on message receipt. The health condition of the scuba divers is monitored using the parameters like temperature, heart beat while navigating the sea. Thus, the proposed system allows the efficient communication between the navigator and the monitoring team using IR wireless communication system.

Fig.1: Communication between scuba divers in underwater

3. SOFTWARE AND HARDWARE SPECIFICATION REQUIRED

- **AURDINO IDE**

The Arduino Integrated Development Environment (IDE) is a cross-stage application (for Windows, macOS, Linux) that is written in capacities from C and C++. It is utilized to compose and transfer projects to Arduino viable sheets, yet additionally, with the assistance of outsider canters, other merchant improvement sheets. The source code for the IDE is delivered under the GNU General Public License; form The Arduino IDE underpins the dialects C and C++ utilizing extraordinary guidelines of code organizing. The Arduino IDE utilizes the program Arduino to change over the executable code into a book document in hexadecimal encoding that is stacked into the Arduino board by a loader program in the board's firmware. Naturally, Arduino is utilized as the transferring instrument to streak the client code onto official Arduino boards.

HARDWARE SPECIFICATIONS RRQUIRED

- **Arduino Nano**

The Arduino Nano is a small, complete, and bread board-friendly board based on the data ontheATmega328Preleasedin2008.It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor. The Arduino

Nano is equipped with 30 male I/O headers, in a DIP-30-like configuration, which can be programmed using the Arduino nano as be using the Arduino Software integrated development as an environment (IDE), which is common to all Arduino boards and running both online and offline. The board can be powered through a type-B mini-USBcableorfroma9Vbattery.

- **IR LED Transmitter**

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 Receiver(TSOP1738)**

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.

- **LCD Display**

It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments.

- **Keypad**

It is used to type in the messages

- **Body Temperature Sensor**

It is used to measure the temperature rise of a navigator while navigating in a sea. Infrared (IR) temperature sensors alter correct non-contact temperature measuring in medical applications. Infrared (IR) temperature sensors alter correct non-contact temperature measuring in medical applications. The fore most common application for this sort of temperature sensing element is menstruation near temperature, fore head temperature, or skin temperature. Temperature sensing element could be a device won't to live the temperature through associate electrical signal it needs a thermometer or RTD (Resistance Temperature Detectors).

- Heart Beat Sensor

Pulse detector may be a well-designed plug-and play heart-rate detector for Arduino.

It will be used by students, artists, athletes, makers, and game & mobile developers WHO wish to simply incorporate live heart- rate knowledge into their comes. It conjointly includes Associate in Nursing ASCII text file watching app that graphs your pulse in real time.

- Emergency and Interaction Switches

It is used in any emergency situation is occurred in underwater sea navigators the diver can switch on these emergencies switch his monitoring team can rescue him.

4. PROCEDURE

Preparation of the system: First, prepare the underwater wireless communication system by selecting the appropriate IR sensor, transmitter, and receiver. Ensure that the components are compatible with each other and can function underwater.

Design the circuit: Design a circuit that can convert the signals received by the IR sensor into digital signals that can be transmitted and received wirelessly. The circuit should also include a power source to ensure the system is continuously powered.

Test the circuit: Test the circuit to ensure that it is functioning correctly. This can be done by connecting the transmitter and receiver and testing the data transmission. Ensure that the signal is strong enough to travel through water.

Water proof the system: Once the circuit is working correctly, water proof the system by enclosing it in a water proof casing. This will ensure that the system is not damaged by water.

Test the water proofed system: After water proofing, test the system again to ensure that it is still working correctly. Check the signal strength and transmission quality.

Deploy the system: Once the system is functioning correctly and is waterproofed, it can be deployed underwater. Ensure that the system is secure and cannot be easily damaged.

Monitor the system: Monitor the system regularly to ensure that it is still functioning correctly. This can be done by checking the signal strength and transmission quality. Make any necessary repair so adjustments as required.

Overall, the procedure for setting up an underwater wireless communication system using IR sensors involves designing and testing a circuit that can convert signals into digital signals, waterproofing the system, and deploying and monitoring the system to ensure that it is functioning correctly.

HEALTH MONITORING OF THE SEANAVIGATORS

Fig.2: A Scuba diver

Almost no other device to watch the health condition of sea navigator while navigating the sea. While there is a wearable device for monitoring his/her pulse by using the heart beat sensor. We can also monitor the temperature of the sea navigator while navigating the sea with the help of the body temperature sensor. The device consists of an inbuilt emergency switch which is used in an emergency situation at that time the sea navigator can switch on his/her monitoring team can secure him/her. The sensors which are used to monitor the health condition of the sea navigators are:

- Body temperature sensor
- Heart beat sensor
- Emergency switch

This is the best device which helps to monitor the health condition of these a navigators.

A. Need of underwater wireless communication

For avoiding huge cost of wired network deployment for conducting experiments over extensive - distance for performing temporary trials over communication. Now, we can see about the system architecture of the underwater wireless communication in three major terminologies as an acoustic link, local sink, and virtual sink. These terms are used throughout the underwater wireless communication research field.

So, scholars need to know the fundamentals of underwater wireless communication systems.

By the by, wear proud to say that our resource team has the strong ground work in the basics of

Underwater wireless communication to develop future technological advancements.

5. ADVANTAGES

Simplicity: One of the advantages of infrared communication is the simplicity of its general operating principle. The technology is relatively easier to implement than other wireless communication technologies.

Power Efficiency: The LED used in blasting IR beams has low power requirements. Furthermore, the entire IrDA transmitter can be operated with small and non-rechargeable batteries. These batteries can last for months. The technology is suitable for low-power use-case scenarios, such as in the case of small and portable devices.

Economy: Underwater communication systems are useful for commercial purposes; particularly in industries such as oil and gas. The ocean is full of a lot of resources, and these systems are used in carrying out exploration of these resources. In the oil and gas industry, for example, AUVs are used in making maps of the seafloor before operations. This will keep these oil and gas practitioners well in formed in setting up their pipelines, and to her infrastructure. This ensures their infrastructure is set up, without posing any harm to the environment. **Security**: Underwater Communication systems are instrumental in ensuring the security of a nation. It is used by the military, to conduct underwater surveillance, as well as to detect intrusion. As rival states might plan as a bot age through the water; having a communication system in the body of waters will alert the nation to the danger. Also, as drug traffickers now deploy autonomous submarines for their operations; having strong communication systems will help to detect and keep them off. So, this system can be easy and fast communication with underground water.

6. RESULT

This project is focusing on transmitting light signal (remote) from the transmitter ending to the receiver ending using the infrared light radiation equipment in underwater, this design is called the underwater wireless communication system. The designing in this project devoted on the development of the conventional infrared radiation communicating by increasing the transmission distance and the effective signal coverage region, likewise, this system has unique advantages such as minimal effort with low-cost, high-speed communication and almost no limitations of bandwidth range.

Our system not only enables communication through under water channels but also provides information about the health condition of the person transmitting the message. With this system,

communication can be established without the need for expensive infrastructure, making it an ideal solution for various applications, including marine research, underwater exploration, and submarine operations

Fig.3: Result of the underwater communication system

7. CONCLUSION

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.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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