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A Review Paper On "IR Wireless Underwater Communication System"

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Abstract: The fusion of Infrared technology with Raspberry Pi Pico in this novel underwater communication system represents a paradigm shift in addressing the challenges of underwater data exchange. By harnessing the unique properties of Infrared light, which exhibits minimal attenuation in water, the system achieves efficient transmission over short distances, where traditional wireless methods falter. Raspberry Pi Pico's affordability and versatility empower the system as a cost-effective control unit and data processing platform, enabling modulation of data into IR signals for transmission. This breakthrough not only revolutionizes communication in fields like oceanography, marine biology, and military operations but also paves the way for enhanced capabilities in underwater robotics, where real-time data exchange is pivotal. Beyond its immediate applications, the system's scalability offers promise for broader deployment, facilitating collaborative research endeavors and contributing to a deeper understanding of the underwater world. In essence, the IR Wireless Underwater Communication System utilizing Raspberry Pi Pico embodies innovation at the intersection of technology and exploration, heralding a new era of connectivity beneath the waves.

Index Terms **- Underwater communication, Infrared technology, Raspberry Pi Pico, microcontroller, Data transmission.**

Introduction. 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, and rivers and require large costs for laying those wires and their maintenance. Our system makes use of an 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 Bluetooth connected to it in order to send message. We use one water barrels in order to demonstrate underwater communication using IR signals passing through those containers. The system also has an acknowledgment receipt message that is sent back from the receiving circuit to the transmitting circuit on the message receipt. This allows for efficient communication between two circuits wirelessly. The IR Wireless Underwater Communication System is a wireless communication system that uses infrared (IR) light waves to transmit and receive data. The system consists of three parts: a land-based unit, an electrical unit, and a submarine model. The land-based unit sends radio waves to the submarine model, and the submarine model sends commands to the land-based motor unit to control the submarine's floating and submerging. Underwater communication systems can be achieved through wires or wireless. Wireless communication uses acoustic, laser, or radio waves. The development of underwater communication began during World War 2 for military purposes. The father of underwater communication can be considered Leonardo da Vinci, who discovered the possibility of listening on a long submerged tube to detect the approach of a distant ship. But the development of underwater communication, in the modern sense of the word, began during World War II, for military purposes. Successful underwater communications

can be realized in two ways: through wires (submarine cables or tethers) or wireless, using acoustic, laser or radio waves.

II. AIM

The design of the project focuses on the transmitting light signal from the transmitter ending to the receiver ending using infrared light radiation equipment in underwater and this design is said to be an underwater wireless communication system. The aim is to develop an efficient and affordable IR wireless underwater communication system using the Raspberry Pi Pico that can be used for various underwater application , including research , exploration , and monitoring.

III. WORKING PRINCIPLE

The working of an IR (Infrared) wireless underwater communication system using Raspberry Pi Pico Data to be transmitted is encoded into a suitable format. This encoding ensures that the information can be reliably transmitted and decoded at the receiving end. The encoded data is then modulated onto an infrared carrier signal. Modulation varies the characteristics of the carrier signal (such as its intensity or frequency) according to the data being transmitted, preparing it for underwater transmission. The Raspberry Pi Pico, equipped with suitable hardware, acts as the IR transmitter. It controls the modulation and emission of the IR signal into the underwater environment. Infrared light is used because it experiences minimal attenuation in water, allowing it to travel through the medium without significant signal loss. The emitted IR signal propagates through the water towards the receiver. At the receiving end, another Raspberry Pi Pico, serving as the IR receiver, is used to capture the incoming IR signal. It is equipped with IR-sensitive components to detect the IR light. The received IR signal is demodulated by the receiving Raspberry Pi Pico to extract the encoded data from the carrier signal. Demodulation reverses the process applied during modulation, revealing the original data. The demodulated data is decoded to revert it to its original format. The decoding process ensures that data is in a usable form for further analysis or control. The Raspberry Pi Pico at the receiving end processes the decoded data. It can perform tasks such as error checking and correction, data analysis, or command execution based on the system's design and intended application. Finally, the processed data can be presented to the user or utilized within the underwater system's application. This may involve displaying data, controlling equipment, or interacting with other systems for various underwater tasks. Operation is the effective use of the Raspberry Pi Pico microcontroller boards at both the transmitting and receiving ends. The Raspberry Pi Pico facilitates data encoding, modulation, demodulation, data processing, and interface with the infrared hardware components, enabling reliable wireless communication in an underwater environment.

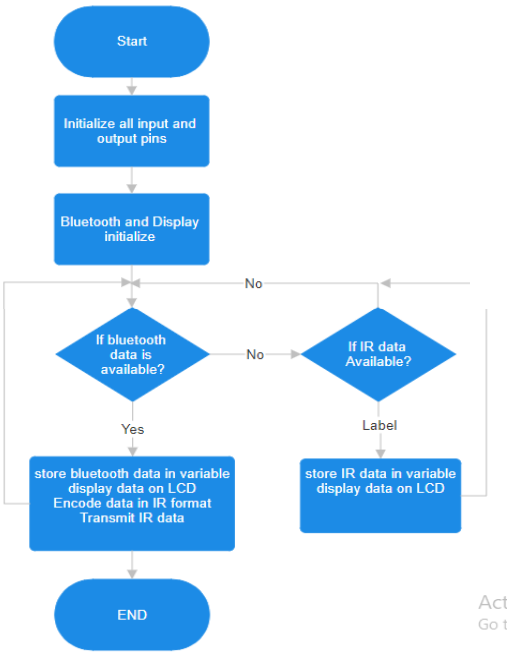

FIG. 2. FLOW CHAT

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IV. PROPOSED SYSTEM

At the heart of the proposed IR wireless underwater communication system lies a robust integration of Raspberry Pi Pico microcontroller boards, promising a versatile and efficient solution for underwater data exchange. Leveraging the capabilities of Raspberry Pi Pico as the central control unit empowers the system with advanced data processing functionalities tailored specifically for underwater communication challenges. Its compact size and affordability make it an ideal candidate for deployment in diverse underwater applications, ensuring seamless encoding and modulation of data for transmission through IR signals. This strategic utilization of Raspberry Pi Pico not only streamlines communication processes but also underscores the system's adaptability and scalability to meet the evolving needs of underwater environments. An infrared (IR) wireless underwater communication system uses two communication modules to transmit and receive data using infrared radiation. Each module has a transmitter - receiver that transmit and convert the received data. The water acts as a medium between the transmitter and receiver. The system can be used to communicate messages through water. The IR wireless underwater communication system represents a valuable addition to underwater technology, offering a reliable means of transmitting data between the waves. Continued research and innovation in this field have the potential to unlock even more possibilities for underwater exploration and communication.

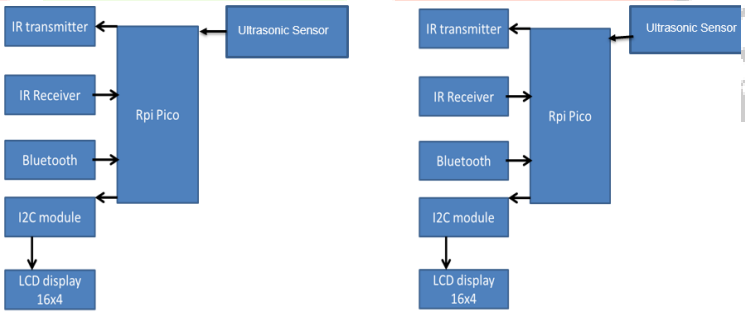

Fig. 2. BLOCK DAIGRAM OF IR WIRELESS UNDERWATER COMMUNICATION SYSTEM

V. RESULT AND DISCUSSION

Our system not only enables communication through underwater channels but also provides information about the obstacle which are between IR signal . This system can be a cost-effective alternative to laying heavy physical wires through the sea or river that require significant upfront costs and ongoing maintenance expenses. With our 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.

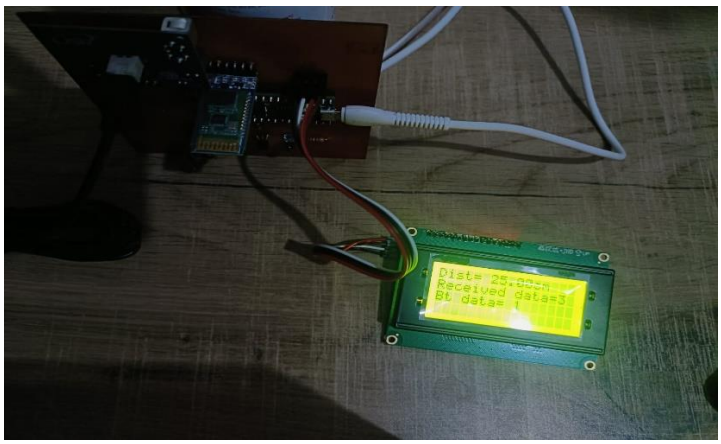

Fig .3 Bluetooth Data is send through Application

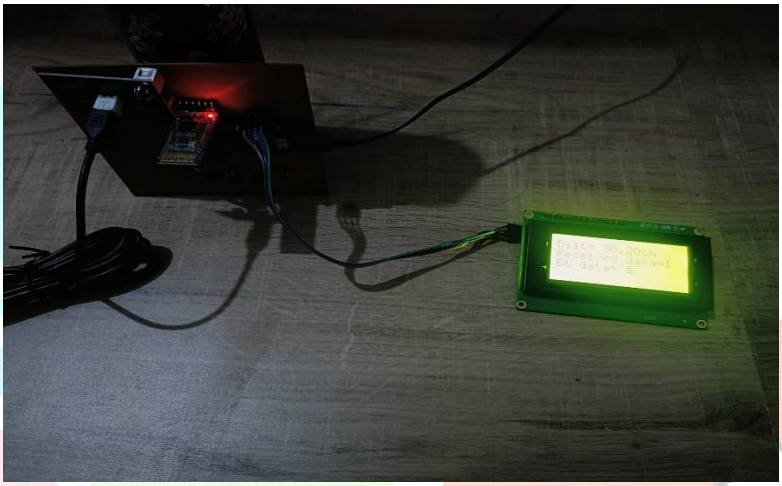

Fig. 4. Bluetooth Data is Received through IR signal

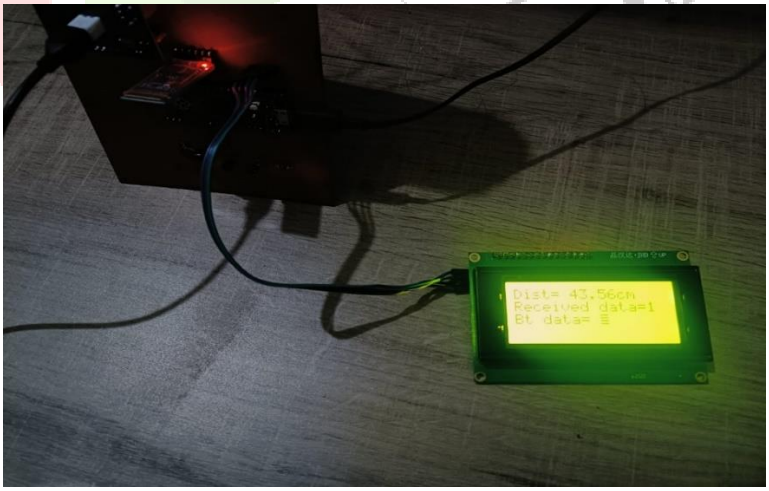

Fig.5. Obstacle is detected by waterproof ultrasonic sensor

VI. CONCLUSION

The IR Wireless Underwater Communication System presented in this project offers a cost-effective and efficient solution for short-range communication in underwater environments. By utilizing Raspberry Pi Pico microcontrollers and IR technology, the system enables wireless transmission of messages even through water bodies. While the system demonstrates effectiveness in relatively clear water scenarios, it's essential to acknowledge its limitations and consider alternatives like ultrasonic for more reliable and versatile communication in challenging underwater conditions. In this project using IR technology we can measure the depth of water also we get the information about obstacle in the water between the communication . Overall, this project lays a foundation for exploring innovative approaches to underwater communication for various applications, including marine research, exploration, and environmental monitoring.

VII. ACKNOWLEDGMENT

IT GIVES US GREAT PLEASURE IN PRESENTING THE PRELIMINARY PROJECT REPORT ON " IR WIRELESS UNDERWATER COMMUNICATION SYSTEM ".

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