UNDERWATER WIRELESS COMMUNICATION SYSTEM

Objective:

To design and implement an underwater wireless communication system using Arduino Uno and infrared (IR) LEDs, enabling digital data transmission between two microcontroller-based nodes. The goal is to simulate an optical communication method suitable for short-range underwater signaling, such as between autonomous underwater vehicles or diver-to-diver communication, using low-cost, open-source hardware.

Hardware used:

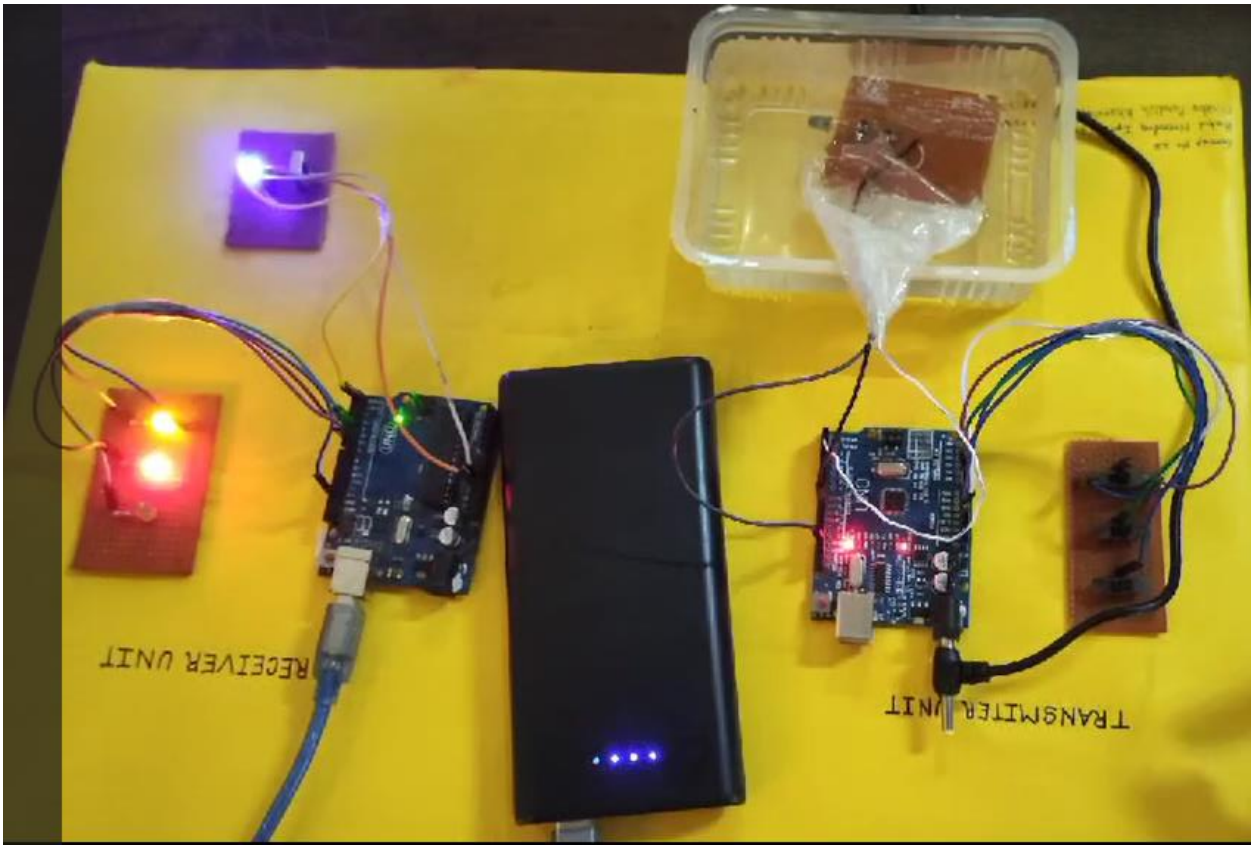
S. No.	Component	Quantity
1	Arduino Uno R3	2
2	IR LED	1
3	TSOP1738 / Photodiode	1
4	Slide Switch	3
5	LED (Red/Green/Yellow)	3
6	Resistors (220Ω, 10kΩ)	Several
7	Breadboard	2
8	Jumper Wires	~20
9	USB Cable / Power Supply	2

Working principle:

- Transmitter circuit and Receiver circuit are used.
- Both transmitter and receiver are powered by separate power supplies and have independent Arduino Uno boards.
- **Transmitter Side**: Three switches are named S1, S2, and S3.
- **Receiver Side**: Three LEDs are named L1 (Green), L2 (Red), and L3 (Yellow).
- When a switch is pressed, the Arduino detects the input and generates a digital signal.
- This signal is sent to an IR LED, which emits modulated infrared pulses.
- The IR pulses are transmitted through air or water and received by a TSOP1738 IR receiver.
- The TSOP1738 demodulates the signal and passes the decoded pulse to the receiver Arduino.

- The Arduino compares the received signal with stored logic to identify which switches were activated.
- Based on the result, the corresponding LED (L1, L2, or L3) is turned on to indicate the received message.

Hardware/testing:



Conclusion:

This project successfully demonstrates a simple, low-cost underwater wireless communication system using Arduino and infrared (IR) technology. By implementing a transmitter-receiver pair with IR LEDs and sensors, binary data was transmitted wirelessly and decoded in real-time using microcontrollers.

The use of slide switches, IR emitters, and photodiode/TSOP receivers provided a reliable way to simulate basic digital communication in an underwater environment. The modular Arduino-based design ensures flexibility and ease of expansion for more complex signaling systems.

This prototype lays the foundation for future developments in underwater communication for robotics, diving assistance, or autonomous submersibles, where traditional radio-based communication is ineffective.