WIRELESS COMMUNICATION FOR UNDERWATER CRAFT USING LI-FI TECHNOLOGY

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ABSTRACT
Data transmission is generally done with the help of a network. In many applications such as underwater communication, environmental monitoring etc., the wireless communication is necessary because of the problems associated with installation and maintenance of the traditional wired network. Authors have proposed the application of LI-FI technology for underwater communication. The proposed system design is presented in this paper. The present underwater communication systems, are based on the electromagnetic, acoustic and optical signals. To overcome the disadvantages of these systems, the LI-FI based communication system is proposed by the authors for underwater communication.

Keywords: LI-FI technology, Underwater Communication, Wireless Communication, etc.

INTRODUCTION
Wireless transmission systems are performing better in the air medium than water. The underwater communication is effectively possible with the implementation of the advanced systems and use of modern equipments. The underwater communication has the impact of the factors such as salinity, turbidity, pressure, temperature, amount of light entering the water surface and their effects on waves.

Application of Li-Fi technology results in improvement of communication systems for Navy and Submarine. The properties of this technology such as the high speed data transmission, high security and energy efficient behavior makes it suitable for the underwater communication.

The proposed system will be effective in identification of the enemy's position and communication between the submarines. The communication will be based on the coding in order to provide the data security using different coding languages and protocols. Light Fidelity is a wireless networking system that provides data transmission through light and would reduce/eliminate EMI concerns. The Navy and industries are looking forward for the application of this technology in communication. Authors have developed the prototype of the system based on transmitter and receiver for communication.

OBJECTIVE OF THE WORK
The work is carried out to achieve the following results:
Designing the communication system for underwater applications.
Implementing Li-Fi technology for communication
Overcoming the limitations of present underwater communication systems.
Developing a secured and energy efficient system for communication.
Block Diagram of the Proposed System Components
The block diagrams of the transmitter and receivers are as shown in below figures. The transmitter operation is based on the microcontroller. The signal to be transmitted is coded before transmission in the proposed module.
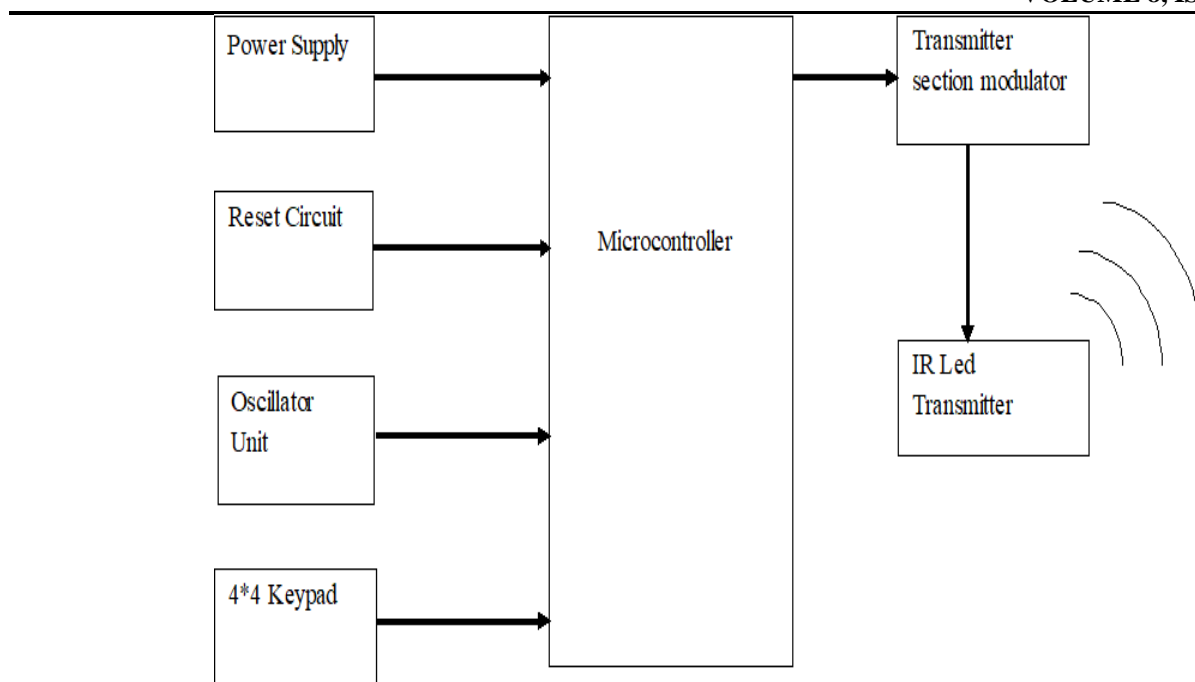
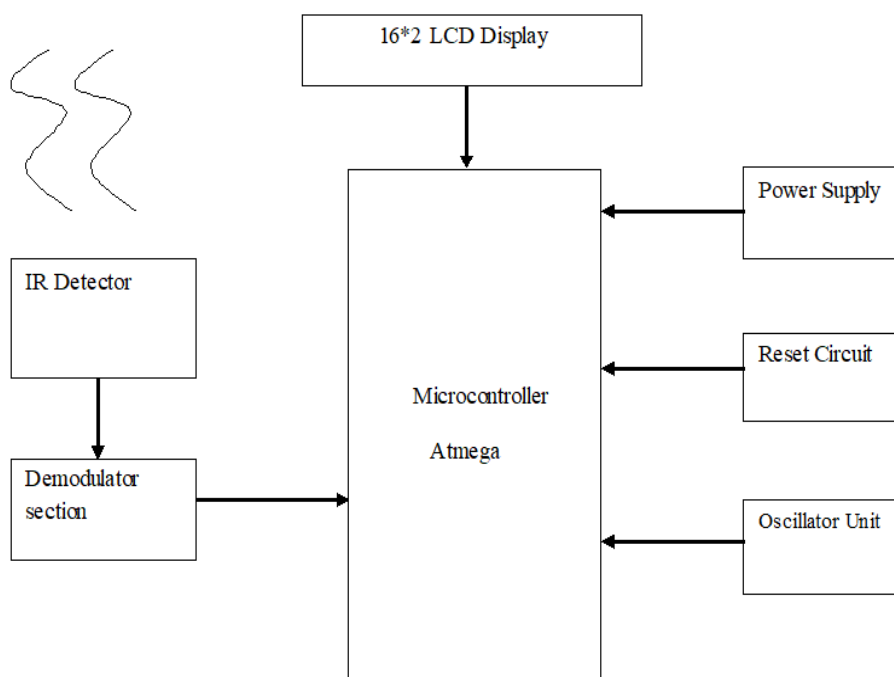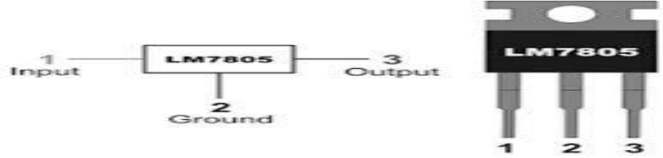Fig.1: Block diagram of Transmitter Section

Fig.2: Block Diagram of Receiver section
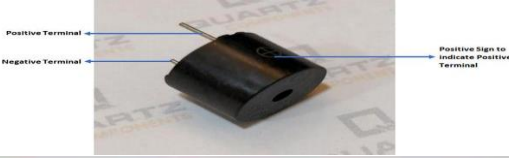
The receiver, receives and decodes the signal received from transmitter. With the help of the microcontroller based transmitter receiver systems, accurate, effective and secured communication is possible.

The communication is based on the LED lights transmitting the frequency. The rapidly changing LED lights flash a mile-a-minute to enable data to be transferred over a Nema code-esque system of blinks. The LED flashes emit lights that correspond with a computer language comprised of zeros and ones.

SYSTEM DEVELOPMENT

Following table shows the selected components for development of the prototype.

Sr. No.	Component	Figure/ Picture
1	IC 7805 based DC power supply.	
2	Atmel®AVR® ATmega8	
3	IR Transmitter	
4	IR Receiver TSOP18	
5	16x2 LCD	
6	4x4 Matrix Keypad	
7	Piezo Electronic Buzzer	
8	Receiver Module OS-RX04-ASK	
9	Transmitter Module MO-SAWR	

ALGORITHM FLOW CHARTS

The flow chart shown in below figure is representing the transmitter operation cycle.
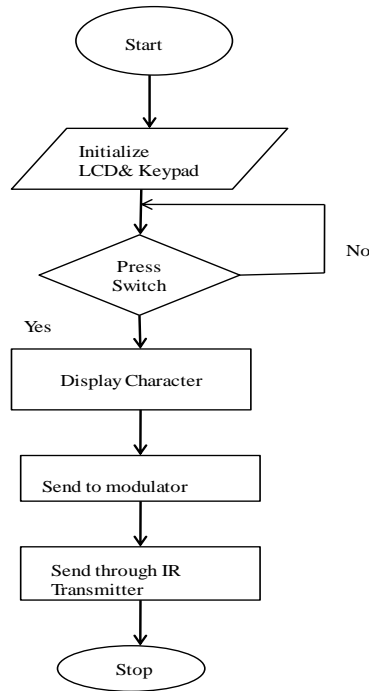

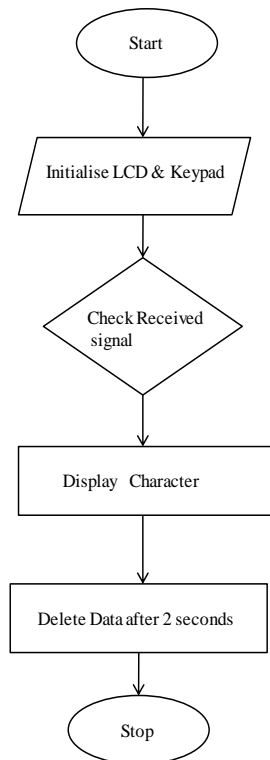Fig. 3: Flow of Transmitter

Fig.4: Flow of Receiver

CONCLUSION

Authors proposed the implementation of the Li-Fi technology for the application of underwater communication for submarine. The transmitter-receiver based system is proposed for the said application development using arduino microcontroller. The proposed system is found suitable over the conventional

communication systems in terms of the performance, energy consumption, security of the data. The communication system uses the encoded data in order to provide the security to the information. The system is found suitable for the underwater communication between the submarines. The system also finds applications in identification of environmental situations, enemy and other object identification needed for submarine.

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