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Underwater Communication Using Light Fidelity Method

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Abstract: ***In current world, we all are using so many communication Technology either it may be wired or wireless, the population of the world became more larger and their requirement of the communication bandwidth is also needed more. In terrestrial communication sending and receiving the information is quite easy and the network can provide high speed data service at low cost but in underwater communication sending and receiving the information is quite difficult because radio waves cannot travel in underwater. Generally, water have conductivity in nature. Organic particles and optical properties are there, the solution for the communication in water is Light. We can send and receive the information using light fidelity in water. The future applications of Li-Fi could serve a much more purpose than just for underwater, airplane, and chemical plant usage.***

Keywords—Communication, Li Fi, LED, Underwater, VLC

INTRODUCTION

Under water communication is a real challenge and already a lot of technologies have been tried to make the communication easy. Most of them are complex architectures as they have to deal with water, mostly saline sea water.

Li-fi-light fidelity is similar to wi-fi technology and it is one of the future wireless communication technologies. The range of data transmission in li-fi is faster 100 times than wi-fi. An application to transfer information from one system to another system through visible light. VLC uses light as a medium to deliver high speed communication. The light of the li-fi doesn't run through partition, therefore it is more protected and hacking is not possible and the data transfer is more protected.

VLC-Visible light communication 10,000 times large than entire radio spectrum, VLC transmission data 224 GB per second. It covers the frequency (4,30,000 to 7,70,000 GHZ) Which means 400nm to 700nm. ultraviolet to near infrared is consider as VLC Light fidelity indicates wide range of available frequencies. Light fidelity as solid-state lighting using LED Bulbs. light emitting diode (LED) is suitable for underwater Communication. It is found that Blue – Cyan-Green Spectral range of wavelength 490nm to 560nm is suitable for underwater communication.

We obtain low absorption, scattering and attenuation loss in the Blue – Cyan- Green Spectral range. By the help of this method, we can send the information, the information may be text, image, audio. The need for underwater wireless communications exists in applications such as remote control in off-shore oil industry, pollution monitoring in environmental systems, collection of scientific data recorded at ocean-bottom stations, speech transmission between divers and mapping of the ocean floor for detection of objects, as well as for the discovery of new resources. Wireless underwater communications can be established by Li-Fi technology. Underwater communications are a rapidly growing field of research and engineering as the applications, which once were exclusively

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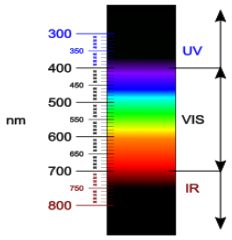
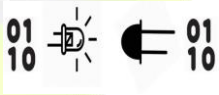
military, are extending into commercial fields, the possibility to maintain signal transmission, but eliminate physical connection of tethers, enables gathering of data from submerged instruments without human intervention, and unobstructed operation of unmanned or autonomous underwater vehicles. Light signals can travel long distance without any obstruction in water, because of high speed of light, in underwater data communication is possible to increase the data rate using "Li-Fi" technology.



2. PRINCIPLE OF LI-FI TECHNOLOGY

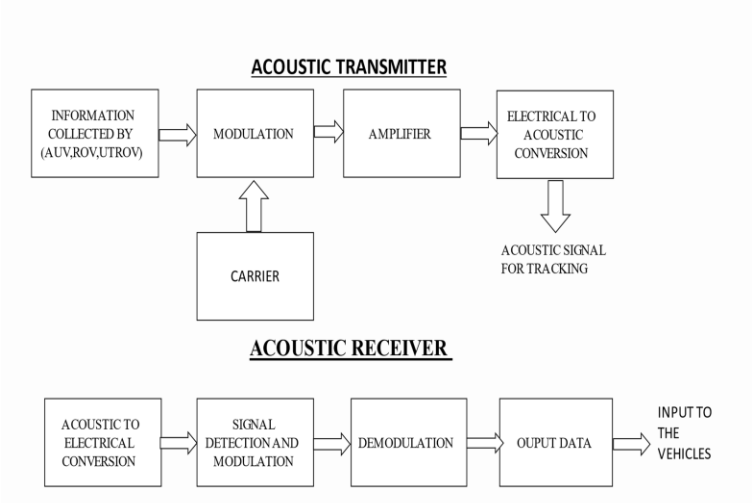
The important component of the Li-Fi technology is the high power Led lights, it can be turned on & off quickly less than 1 microsecond which cannot be detected by the human eye and this will appear to be continues beam of light. This change from on state to off state in high frequencies enables the data transmission. On states „1" and off states „0"the data can be encoded and modulation techniques can be done faster than the human eye can detect it. A solar can be used to receive the transmitted data from the light source and generates the original data. This method continuously receives, the pulses of light and decode into the stream of data is referred as VLC (visible light communication).

WORKING OF LIGHT FIDELITY



3. EXISTING SYSTEM

- Acoustic is the most preferred signal used as carrier by many Application, owing to its low absorption characteristic for underwater communication. Using electromagnetic wave, the communication can be established at higher frequency and bandwidth. The limitation is due to high absorption/attenuation that has significant effect on the transmitted signals.
- Antenna needed for this type of communication, thus affects design complexity and cost. Due to absorption



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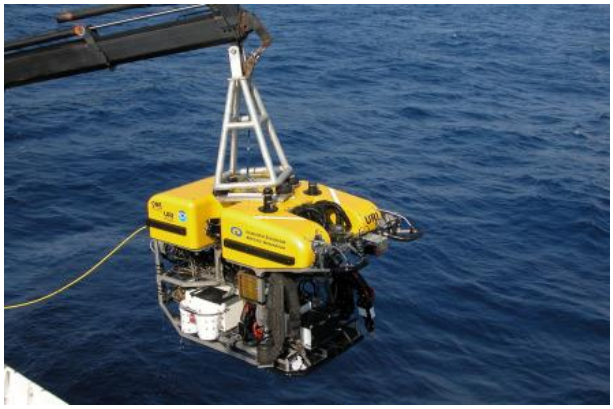
characteristics of sea water ultrasound is not used for underwater communication. If the source or destination is moving then the Doppler effect will stretch of shrink the transmitter section. Unwanted noise signal may be present. Digital signal processing can be used for minimizing the disadvantages of ultrasound underwater communication

INFORMATION COLLECTED BY AUV AND ROV

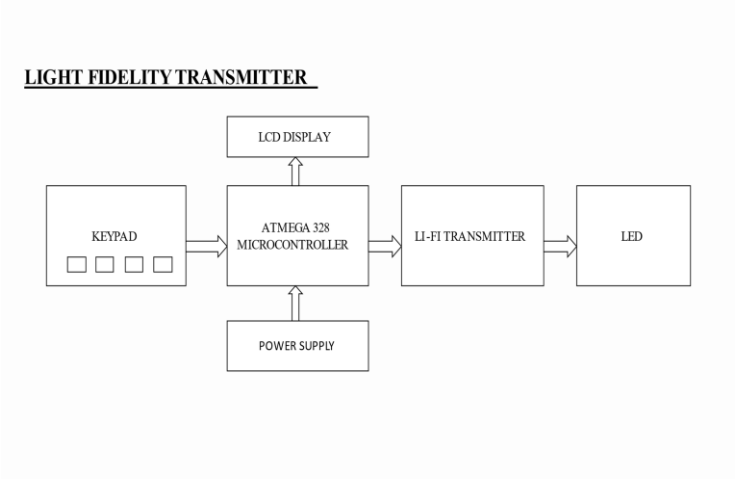


4.PROPOSED SYSTEM

Implementation of underwater communication through Li- Fi. The system transfers voice signal, which is transmitted using light waves.

Light implementation in vehicle

5. SYSTEM ARCHITECTURE



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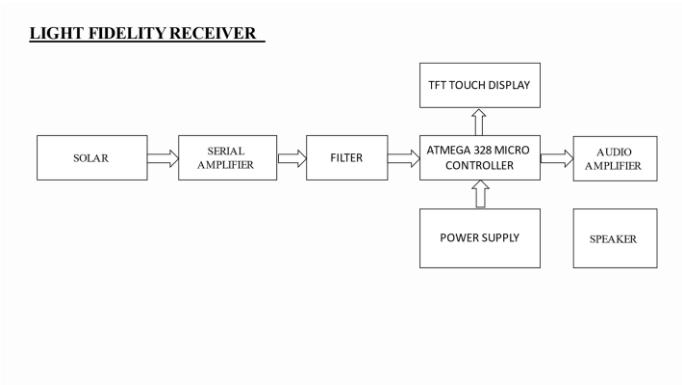

. Basic Architecture of transmitter and receiver

When a data is applied to an LED bulb, it emits a constant stream of data observed as visible light. When this given source is varied slowly, the bulb dims up and down. As these LED bulbs are semiconductor, the output can be modulated at extremely high speeds that can be detected by a solar and converted back to electrical current.

A. Transmitter

The data transmission of underwater has two sections. It has transmitter and receiver. In this model pre-defined data are given to the keypad. keypad has 4 set of keys already programmed by microcontroller chip. 2 keys for text and 2 keys for Image. Audio is not a predefined one. We can use a hydrophone, as a source to pass the data which output is audio. This data passed to the ATMEGA 328 micro controller.

ATMEGA328 is a single chip microcontroller created by audio-video receiver (AVR) family. It has modified Harvard architecture 8-bit reduced instruction set computer (RISC). It is high performance and low power consumption. 2KB EPROM (Erasable programmable read only memory) inbuilt here, that can be erased and reused. Erasure caused by the shining an intense ultraviolet light. The data passed to the light fidelity transmitter. Light fidelity transmitter has high LED matrix and high intensity board to transfer the data in high range. light fidelity transmitter has booster to send the data faster. The data passed to LED (light emitting diode).

We have 3 type of led color to passes the data. Blue, cyan, green has high intensity of light with less attenuation and scattering effect in sea water. In this project walk test are taken and the inverse square law method are implemented to find the correct light color. Blue and green color has same filtering color effect. So, we prefer cyan color for LED transmission. The data passed here is in encoded form for security.

LCD display is used for user reference and the power supply has inbuilt step-down transformer, voltage regulator to provide the efficient power for encoded data transmission.

A1. DIFFICULTIES IN UNDERWATER COMMUNICATION

1. Low Data Rate (Due to speed of sound in water)
2. Multipath Propagation
3. Time Variation of Channel
4. Strong Signal Attenuation
5. Attenuation
6. scattering

A2. CONDITION

1. TRANSMISSION RATE – 9600BPS PER 4 METERS
2. >1 GBPS IN 2M
3. SPEED OF LIGHT IN WATER-2.25*10^8 METERS PER SECOND

B. RECEIVER

Solar is used to captures the data from the LED light and convert one form of energy into another. We can use photo diode also instead of solar but high beam transmission are done here. So solar is effective one for captures the data and power handling capacity is more sizeable when compare to photo diode

Serial amplifier is used to passes the data from the solar in serial manner and it just amplifies the data and given to the filter.

Bandpass filters are mainly involved in wireless transmitters and wireless receivers. The main objective of this filter in a transmitter

is to limit the bandwidth of the o/p signal to the minimum required level and to convey data at the preferred speed and in the preferred form and it passes the data to ATMEGA microcontroller, power supply Provide the power to this controller. ATMEGA check the data whether it is Audio, Image, or Text. If the data is text or Image it passes the data to TFT touch display.
Thin filament transistor is a type of LCD flat-panel display screen. Each Pixels are controlled by the transistors. It is usually designed to run at a specific resolution. If the data is audio, the microcontroller passes the information to audio amplifier. An audio amplifier is an electronic device that increases the strength (amplitude) of audio signals that pass through it. An audio amplifier amplifies low-power audio signals to a level which is suitable for driving loudspeakers. The input signal of an audio amplifier may only measure a few hundred microwatts, but its output may be tens or even thousands of watts. Speaker In order to translate an electrical signal into an audible sound, speakers contain an electromagnet: a metal coil which creates a magnetic field when an electric current flow through it. We transfer and receive the data in fish tank fill it by water.

FEATURES

A. To Transmit Secure Data
B. High Speed and Full Duplex
C. Low Power Requirement
D. Easy to Implement

BENEFITS

1. 1)By using this light fidelity spectrum issues are overcome
2. 2)It provides smooth communication between surface objects and underwater subjects
3. 3)Secure communication between submarine and surface
4. 4)Fast data transfer and low power requirement
5. 5)Easier communication, Better than the current technology and viable in future.

TARGET CUSTOMERS

- Rescue operators at sea
- Coast guard
- Defence or military operations
- Fisherman
- Geological condition trackers
- Submarines
- Scuba drivers
- Treasure hunters at sea

APPLICATIONS

- For Fisherman Security
- Rescue Operations in Sea
- Alerts for Ships
- For Defense Operations

LIMITATION

1)Transmission and reception occurs in straight-straight communication.
2)Distance coverage minimum
3)Data transfer cannot be done without a light source

UWC FOR LARGE DISTANCE TRANSMISSION
Wireless underwater communication can be established by light fidelity along with the use of buoys attached with antennae and photo diode. These buoys are linked to a satellite (in air) to pass a message.

The satellite passes the message to the destination. Since the light fidelity technology cannot be used for very large distances, large distances underwater communication can be done using buoys connected to the satellite in which the data rate would be nearly same as the terrestrial data communication. Since the transmitted signal is in encoded form, so the hackers cannot track the signals, so the privacy/ security of information is obtained. So, the data is not lost.

6. RESULTS

The prototype of the underwater communication using Li-Fi is made. The system has been tested and the data is transmitted from transmitter to the receiver and vice versa. It will be very useful for the divers to communicate with one another. For testing the System, a signal was Send between the transceivers with varying distances and different speed. To better imitate deep ocean conditions, performance tests were performed in the dark. An Embedded code was used to transmit data and assign different transmission speed. Data was successfully Send and received. Outputs are Text, Image and Audio.

7. DESIGN

8. CONCLUSION

This proposed system is useful for the underwater communication at faster speed in Gbps. It can overcome the problem occurring in the communication also it gives the secure communication so the hacking of the system has less chance. It is effective for the security purpose. If this system is used in the Indian Navy it can be more effective for avoids the many problems occurs in the communication between the ships. This system is very cost effective so it can be more effective than the other systems like the Acoustic wave communication and Ultrasonic wave communication. So, this system may be replaced by existing underwater communication techniques and it is better than the existing systems.

FUURE RECESSION

- GPS System
- Ship Navigation
- Under Water Oil Rigs
- Use of Laser

REFERENCES

[1] Bharath b. yashwanth Digumarthi, Ravi T. and G. Jegan, "Bidirectional Communication in Li-Fi Technology" VOL. 11, NO. 13, JULY 2016.
[1] B.R. Thawali, Deshmukh Vishvajeet, Mhaske Nawanath V, Shirgire Vitthal N, "Ship to Ship Communication using Li- Fi Technology" Volume No.03, Issue No. 01, January 2015.
[2] C.Periasamy, K.Vimal, D.Surender, "LED Lamp Based Visible Light Communication in Underwater Vehicles" Volume 13 Number 3 – Jul 2014.
[3] G.Pravin Raj, P.Prabakaran, "Implementation Of Li-Fi Technology For Underwater Communication Through Light Waves" VOLUME 23 ISSUE 1 – MAY 2017 - ISSN: 2349 – 9303.
[4] Lince Mathew, Y P Singh, Swati Sharma, "An Extensive Study on Under-water Communication using LED /LASER Enabled Li-Fi Modules" Vol. 5, Issue 11, November 2016.
[5] https://en.wikipedia.org/wiki/Amplifier
[6] https://en.wikipedia.org/wiki/Photodiode
[7] https://en.wikipedia.org/wiki/Li-F
[8])http://wikipedia.org/wiki/Li-Fi
[9] 2)www.lificonsortium.org/
[10] 3)http://www.lifi.com/pdfs/techbriefhowlifiworks.pdf
[11] 4) http://www.newscientist.com/aricle/mg21128225.400-will-lifi-be-the-new-wifi.html
[12] 5)http://edition.cnn.com/2012/09/28/tech/lifi-haas-innovation