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Underwater Wireless Communication System For Large Distance Transmission

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Abstract

Underwater communication is required in many applications such as transfer of messages and speech transmission between submarines Ships, Scuba divers etc., and also to track lost ships and locate drowned planes. Wireless Underwater Communications can be established by Li- Fi technology along with the use of Buoys attached with antenna and photodiode These Buoys are linked to a satellite(in air) to pass a message. The satellite passes the message to the designated destination. Since Li- Fi technology cannot be used for very large distances, large distance underwater communication can be done using Buoys connected to the satellite in which the data rate would be nearly same as the terrestrial data communications. Since the transmitted signal is in encoded form, so the Hacker cannot track the signals easily, so the privacy /Security of information is obtained. Motor is used to rotate LED/LASER to direct the signal towards the photodiode. So that data is not lost.

Keywords: Li- Fi, antenna attached buoy, data communication, satellite, security, motor, photodiode.

INTRODUCTION

In our system we are going to complement system which uses both Li- Fi technology Underwater(water as transmission medium) and normal tower to tower communication using satellite(air as transmission medium).a proper photodiode as signal receiving

component , and antenna as signal receiving and transmitting component is used.

Li- Fi is a high speed and fully networked optical wireless communication technology which is similar to Wi-Fi. It was proposed by Prof. Harald Hoas. It is measured to be 100 times faster than same Wi-Fi implementations reacting with high speeds.

In this system ships sends the information to the other ship and the other ship also gives response on which the information is received from the ship.

In our system we use satellite for wide range of communication. Satellite sends and receives signals to the antenna attached to the Buoys .The information which is sent by the ship is in encrypted form so that communication is going to take place between the ship is more secure.

EXISTING SYSTEM

1) As far terrestrial application, the underwater wireless communication is not a straight forward process.

2) In most of existing system Acoustic signal is most preferred signal used as carrier by many applications, because of its low absorption characteristic underwater .This has a drawback, as it cannot be used for large distance communication because of signal deterioration.

3) Some existing system use Electromagnetic waves at higher frequency and bandwidth for underwater communication. The limitation is due to high absorption/attenuation that has significant effect on the transmitted signals.

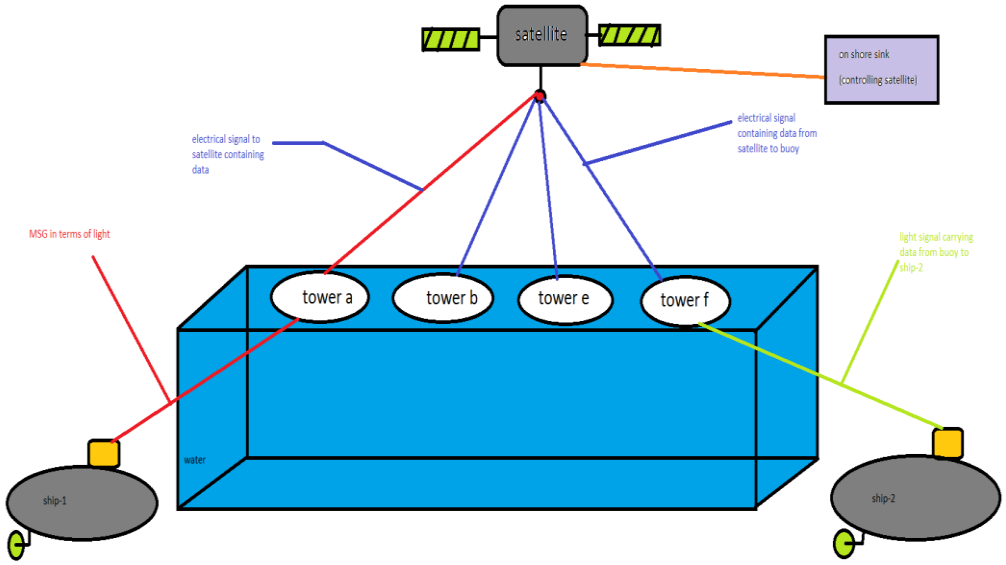
4) Due to absorption of Sea water ultrasound is not used for underwater communication.

5) Some existing systems use only the Li-Fi technology because of its high speed. The limitation here is, it cannot be transmitted for large distances.

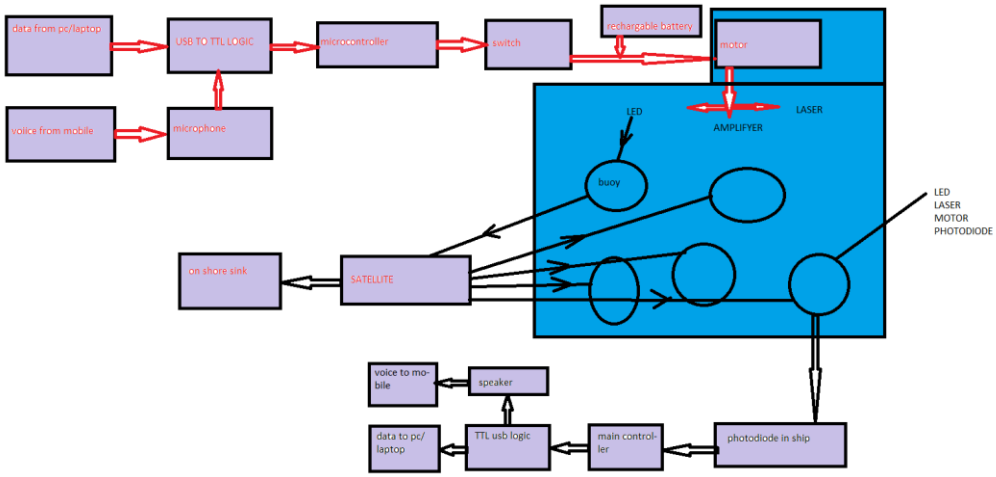
Therefore it is appropriate to use satellite communication along with Li-Fi technology to minimize their limitations.

PROPOSED METHODOLOGY

Underwater communication setup:-



Detailed description of the system:-



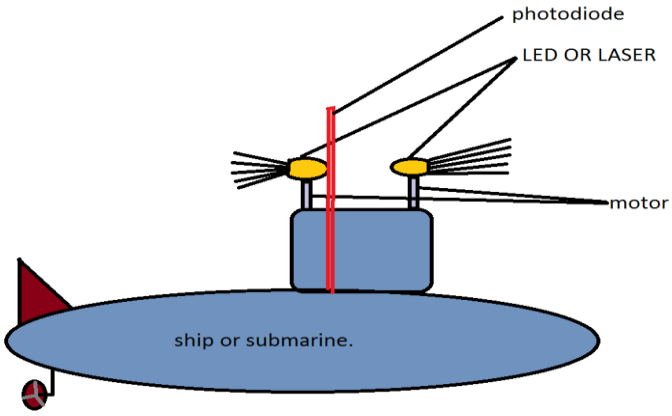
We divide our system into 3 parts:

1. Sender / Ship 1:

- Voice from mobile is converted to electric signals using microphone along with data from PC/Laptop.
- Microcontroller is not compatible with USB port, so we need USB to TTL

converter. It converts data from USB logic to TTL logic. The data from PC/Mobile gets transmitted to the microcontroller. Thus the file is converted into bits with the help of USB to TTL converter and microcontroller.

- We use two different light sources depending on our requirements we select the source (either LED or LASER) with the help of switch. Microcontroller forms the driving circuitry of visible light source. The light gets intensity modulated which contains the data.
- A motor with rechargeable battery must be connected to LED/LASER bulb for it to rotate nearly 360 degree .The light is passed to the water. There is a sensing element at the receiving side called as photodiode.
- Photodiode senses the illumination from the light source (either LED/LASER).It converts optical signal to electrical signal.
- Since the electric bulbs are rotated nearly to 360 degree, there is no way that optical signals will not reach the photodiode.
- Sender also contains photodiode to receive the response destination.
- Fig shows the structure of ship

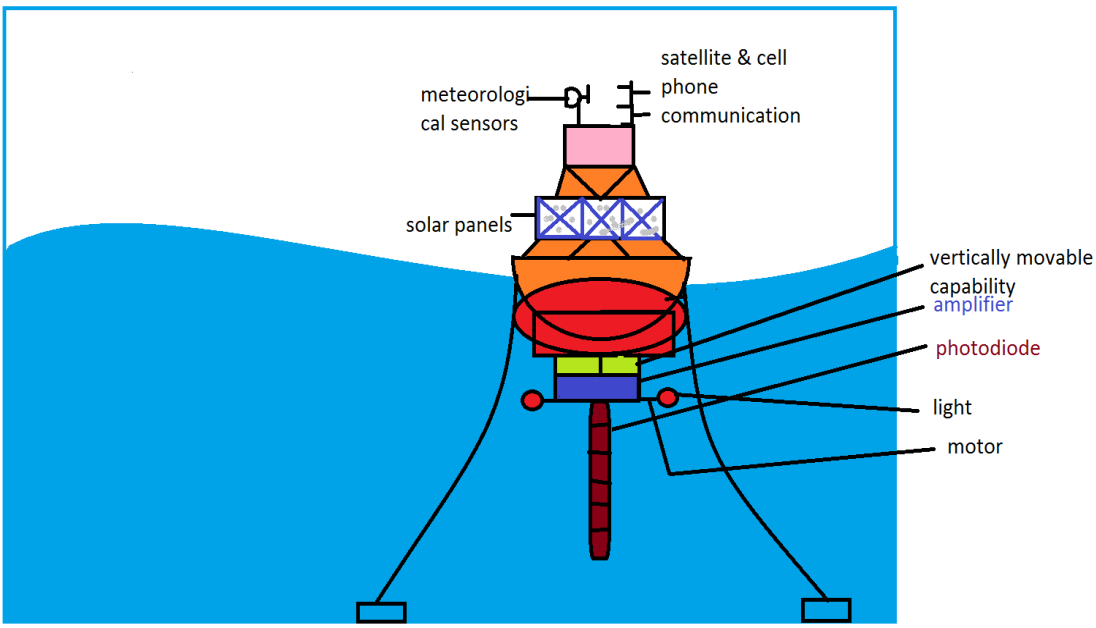


2. Buoys, Antenna and Satellite

- The photodiodes are placed at the bottom part of the buoys (inside the water, dipped).
- After sensing the light, the photodiode converts it to electrical signal.
- This electric signal is transmitted above the sea surface to the antenna.
- Satellite transmitter is used to communicate with the antenna in the buoy which is controlled by onshore sink.

- The signal is transmitted from the satellite to antenna of another buoy within whose range the destination ship is located.
- The electric signal received by antenna is converted to optical signal using LED/LASER connected to motor (for 360 degree rotation) and is passed to the water.
- This optical signal is sensed by the photodiode of the destination ship.

Structure of buoy:



3. Receiver/Ship 2(Destination)

- As the photodiode in ship 2 senses the illumination from the light source coming from buoy, it converts optical signal to electric signal which is passed to the microcontroller which is nothing but the regenerated data.
- Microcontroller identifies the data and route it to the receiver PC/Mobile through TTL to USB converter which converts data from TTL logic to USB logic. Speaker is used to receive voice signals.
- Therefore the original data is successfully received at receivers PC.

FEATURES

1) To transmit secure data – cryptography.
2) High speed.

3) Low power requirement.

APPLICATIONS

1) For rescue operation in sea.
2) For defence or military operations.
3) For fisherman security.
4) To alert ships in case of hurricanes or any natural calamities.

CONCLUSION

This paper gives the overall view of a system which are useful for the ship to ship underwater communication at faster speed .It overcomes the problem which occurs in communication and give the secure communication. Our system is effective for security purpose of the ships.

If this system is used in Navy, it would be more effective for long distance communication.

So it would be efficient if our system would be implemented for underwater communication.

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