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LIGHT FIDELITY BASED DATA TRANSMISSION SAFETY MARINE SYSTEM

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Abstract *– There are currently two trends: First, the extension or enrichment of wireless services and other being increased in user demand for these services, but the available RF spectrum for usage is very limited. So, the technology of Li-Fi came into picture, that uses light as a source of communication.[1] Light Fidelity (Li-Fi) is a technology based on Visible Light Communication (VLC). VLC with Light Emitting Diode (LED) will be an appealing alternative for the present radio frequency communication. Li-Fi is that the most up-to-date development which is resourceful [10]. In this technology, LEDs are used to transmit data in the visible light spectrum. This technology is often compared thereupon of Wi-Fi and offers advantages like increased accessible spectrum, efficiency, security, low latency and far higher speed [9]. This research paper aims at designing a Li-Fi transceiver using Arduino that's ready to transmit digital data. It will be cost efficient and high speed. The reliability of the system is far quite than the present system. It can be extended to places such as hazardous zone, hospitals, radio frequency free zones, etc. The result shows that the data transmission is executed in the system with the Li-Fi transceiver.*

Key Words: LED (Light emitted diode), Wi-Fi (Wireless Fidelity), VLC (Visible light communication), Li-Fi (Light Fidelity).

1. INTRODUCTION

Communication are often defined because the transmission of knowledge, audio and signals from the source to distention or multi destination points, an enormous number of technologies develop to handle this process with high capacity, freed from errors, reliability and serve multi users at an equivalent time with reference to the general performance. The sunshine communication technology is supported by Li-Fi and it is a system that uses wireless communications with high speed. Li-Fi provides a reach of "224" Gbps for sensing data at high speed with the help of "LED" [2]. For transferring data electromagnetically "Li-Fi" uses light whereas "Wi-Fi" uses radio waves. An "LED light" supported semiconductors that uses an immediate power DC supply. It dims up and down at very high speeds, and invisible for human eye. Li-Fi is taken into account because the greatest advancement within the light communication systems. Li-Fi could also be a bidirectional, high speed and fully networked wireless communication technology almost like Wi-Fi. The term was coined by Harald Haas and should be a kind of sunshine communication and a subset of optical wireless communications to RF (Wi-Fi or cellular network), or even a replacement in contexts of data broadcasting. It is so far measured to be about 1000 times faster than some Wi-Fi implementations. To overcome the RF bandwidth limitations, it uses light communication or infra-red and near ultraviolet (instead of frequency wave) spectrum, **an** area of optical wireless communication technology, that carries more information is proposed. The increase in demand for safety onboard ships and spectral overcrowding in data transmission led to the raise of frequently monitoring automated system and radiation free transmission [8]. The radiation free transmission system is a known as visible light communication. The present radio frequency communications result's in high spectral overcrowding and radio interference in ships. The VLC with LEDs are going to be an appealing alternative for this frequency communication. At present wired network is employed for safety purposes in ships. It requires high maintenance. Whereas the proposed system Li-Fi is a wireless transmission system which links the marine safety systems with it, thus providing a best safety system at low maintenance cost and high efficiency [10].

1.1How Li-Fi Works

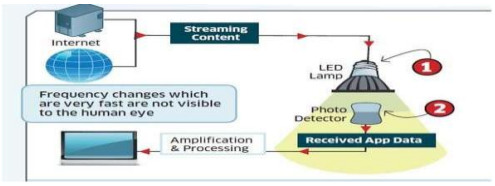

Fig -1: Lifetime working mode

Li-Fi using light rather than gigahertz radio waves. Use an array of LEDs, and maybe a couple of different colours, and really soon you're handling data rates within the range of hundreds or megabits per second, This is accomplished by the flickering of LED light bulbs to form code (on = 1, off = 0), and is completed at higher rates than the human eye can detect. The more LEDs in your lamp, then LEDs can process more data. In figure 1. 2 shows how the Li-Fi cloud communicates with

others devices. The only infrastructure is an equipped light bulb. Your internet provider doesn't even get to bring you a box, they only connect you to their power-grid-mounted signal relays, and you're online. At the moment, commercial LEDs are not much smaller than 1mm2 [3]. The Scottish researchers, however, are developing LEDs that are just 1µm2 — one micron, its one thousand-fold smaller. Not only are you ready to cram more of these micron-sized LEDs into the same space as a much bigger LED, but apparently they're going to also flicker on and off 1,000 times faster.

A grid of 1,000 micro-LEDs, flashing 1,000 times faster, would be able to transmit data 1,000,000 times faster than a standard LED. Furthermore, the micro-LEDs are just pixels — and at one micron, the LEDs would be tons smaller than those in your Smartphone's Retina display. You could have an enormous array of those LEDs that double up as a room's light and a display— and provides networking capability on the side [6]. Perhaps a next-next-gen console would communicate alongside your gamepad, smartphone other peripherals via a Li-fi equipped tv.

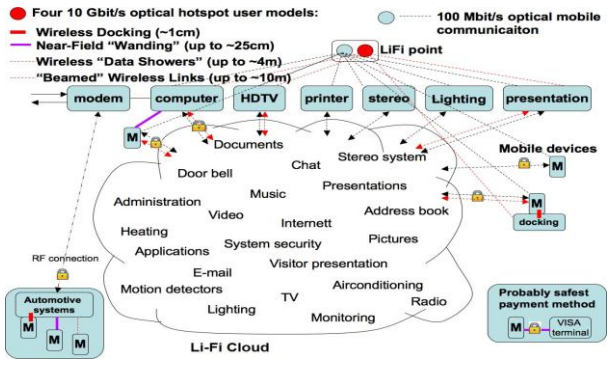

Fig – 2 Working of Li-Fi

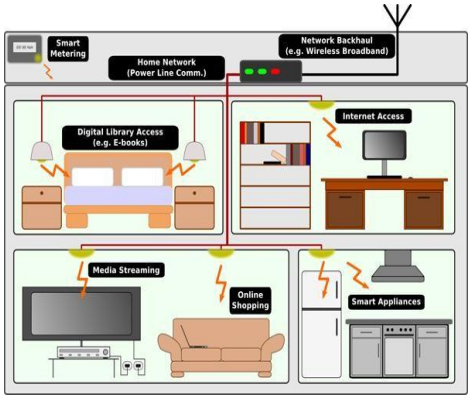

Fig -3 Wireless bridge network

1.2 Block diagram

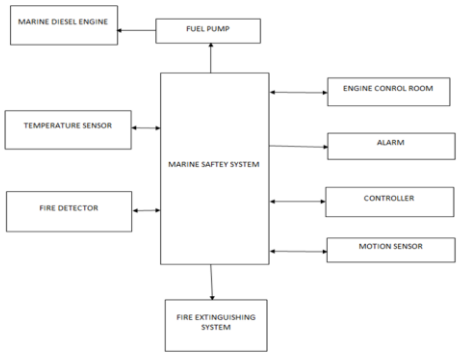

Fig-4 Block diagram of LI-FI marine system

The task of transmitter is to convert digital data into light. An LED was an appropriate component due to its relatively linear relation between current and lightweight intensity. The general idea is to modulate the light intensity of the LED i.e.; the intensity of the light corresponds to the symbol transmitted. The Arduino ports are not capable of delivering the right amount of current to make the light intensity strong and fast enough [7]. To get around this problem a transistor is employed as a switch, which made it possible to modifier a bigger current faster. In schematic is shown to offer a summary of the transmitter. The PCB for transmitter is meant using the subsequent steps:

1) The transmitter PCB design was done by converting the circuit's schematic diagram into a PCB layout. The software used for PCB layout is CAD soft Eagle.

2) After the design of PCB layout, the printout of circuit card is taken out on the glossy paper.

3) Then the copper plate is cut for the circuit card. Also, the top oxide layer is rubbed away.

4) After this, the PCB print gets transferred onto the copper plate.

5) Next the circuit is ironed onto the PCB plate.

6) Next step is to etch the plate.

7) Then the etching solution is carefully disposed of and the therefore the board is cleaned properly.

8) Lastly, the final touches are given to the circuit board

2. SIMULATION

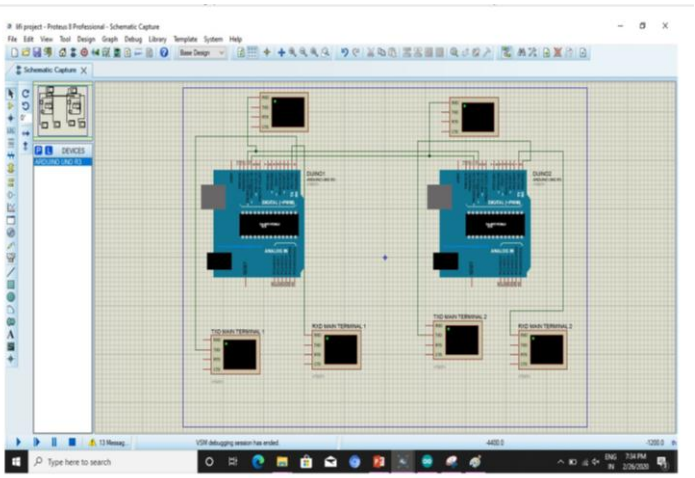

Fig -5 Simulation circuit of LI-FI marine system

2.1 Simulation Results

Tests were conducted to verify the design and see if the right properties were achieved. These tests were mainly done using PROTEUS. The prototype is calibrated by sending text as a test signal so as to adjust the proper resistance values for amplification.

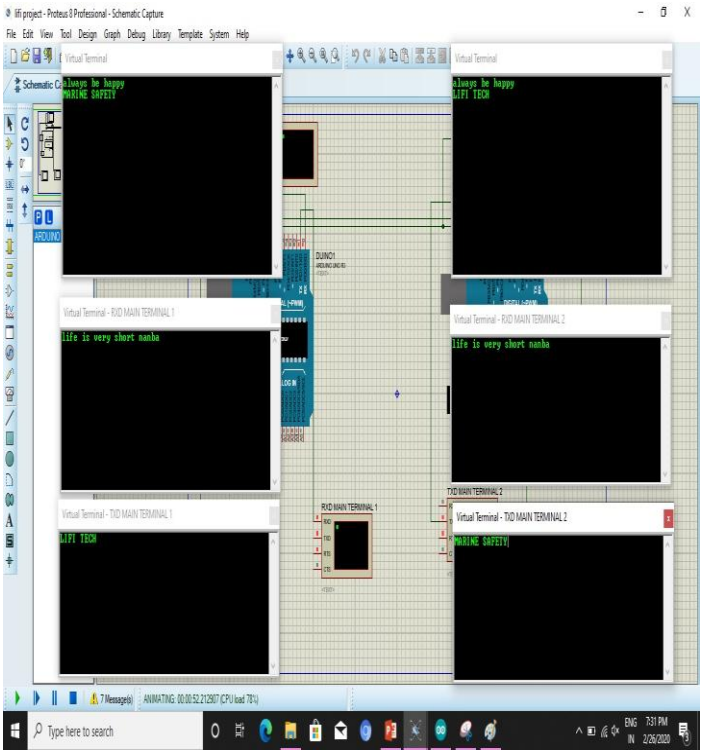

Fig-6 Simulation output

The controller was programmed for numeric inputs and whatever the numeric data entered in the virtual terminal will be modulated and encrypted in the microcontroller and will be transmitted by the LEDs. The data will be received by the receiver then demodulation and decryption will be done in the receiver end and the transmitted data will be shown in the receiver display. In this simulation we entered the numeric value 1 the entered value is processed and shown in the transmitter LED. The transmitted data is received by the receiver and the data is displayed in the receiver. As assumed the transmitted and received data is same without any loss in transmission. The assumed output and the simulation output are same. Thus, data can be transmitted in ships without any radiation or spectral overcrowding to longer distance.

3. CONCLUSION

The possibilities are numerous and can be explored , this technology is in manufacturing process that produce every bulb to become a Wi-Fi hotspot to transmit wireless data and also safe and bright future without radio emission ,because radio waves create a harmful effect for animal thing ,but Li-Fi is that the optical wireless communication for data ,audio and video streaming in LEDs, this sort of latest invention are often encouraged to supply a secure and green technology. Light communication has again shown the potential to assist ships in secure and reliability communication [10]. Light Fidelity communication may be a new technology with widespread application in both ship-to-ship and internal ship communication. Li-Fi also has applications for the Navy outside of ship-to-ship communication in internal communication systems.

REFERENCES

1. Tsonev, D., Chun, H., Rajbhandari, S., McKendry, J., Videv, S., Gu, E., Haji, M.,Watson, S., Kelly, A., Faulkner, G., Dawson, M., Haas, H. and O'Brien, D. (2014) A3-Gb/s Single-LED OFDM-Based Wireless VLC Link Using a Gallium Nitride µLED. IEEE Photonics Technology Letters, **26**, 637-640.

2. Haas,H., Yin,L.,Wang Y. and Chen,C.(2016) What is Li-fi?Journal of Lightwave

3. Badamasi, Y.A. (2014) The Working Principle of an Arduino. 2014 11th Interna tional Conference on Electronics, Computer and Computation (ICECCO), Abuja,29 September-1 October 2014.

4. Tang, Q., Gupta, S.K.S. and Schwiebert, L. (2005) BER Performance Analysis of anOn-Off Keying Based Minimum Energy Coding for Energy Constrained Wireless

5. Sensor Applications. IEEE International Conference on Communications, **4**, 2734-2738.

6. Proakis, J.G. (2001) Digital Communications. 4th Edition, McGraw-Hill, New York.

7. Haas, H. (2011) Wireless Data from Every Light Bulb.

8. K. Pujapanda, —LiFi Integrated to Power-lines for Smart Illumination cum Communication‖, 2013 International Conference on Communication Systems and Network Technologies, IEEE 2013.

9. M. Mutthamma, —A survey on Transmission of data through illumination- Li-Fi‖, International Journal of Research in Computer and Communication Technology, Vol 2, Issue 12, December- 2013.

10. S. Chodhary, D. Kumari, S. Goel, —New Lighting Technology —LI-FI‖ – A Review‖, International Conference on Advances in Engineering, Technology & Management, AETM 2013.

11. S. Vinay Kumar, K. Sudhakar, L. Sudha Rani, —Emerging Technology Li-Fi over Wi-Fi‖, International Journal of Inventive Engineering and Sciences, Vol 2, Issue 3, February 2014.