International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 9 Issue 6 ǁ 2021 ǁ PP. 43-49

Text and Sound Transmission Using LIFI Technology

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Abstract: *On the off chance that you are utilizing remote web in a coffeehouse, taking it from the person nearby, or seeking data transmission at a meeting, you may get baffled at the lethargic rates you face when more than one gadget is associated with the organization. To tackle this issue, a German Physicist- Harald Haas has presented another innovation known as "data through light" which implies transmission of information through LED lights which change in forces quicker than the natural eye can follow. As per him, this innovation depends on the power and capability of the light transmitting diode. This paper draws its consideration on development and working of Li-Fi based framework and contrasts its presentation and the current remote network innovations.*

Keywords: *LI-FI, Wireless technology, Communication*

Date of Submission: 03-06-2021 Date of acceptance: 17-06-2021

I. INTRODUCTION

Now-a-days WiFi runs our life. So talking about the fact, according to the survey carried out by Direct Line by Opinium Research online, it was observed that WiFi was one of the aspect of the life of their respondents that they couldn't live without.Now entering into the world of LiFi, it is a type of wireless connection that can be up to 100 times faster WIFI. Just imagine you are living in the world where you can connect to high speed internet just by flicking on your light switch.LiFi is a wireless optical networking technology that basically uses LED's for data transmission. Recognizing in easy terms, LiFi is considered as a light-based WiFi which uses light instead of radio waves to transmit information. Use of light to transmit data allows to deliver a couple of advantages such as working in areas susceptible to electromagnetic interference like hospitals and aircraft cabins and also working across higher bandwidth while offering higher transmission speed. So it basically uses Visual Light Communication (VLC) which enables high speed data transmission with visible light. The data which gets transmitted is due to modulation of the intensity of light given off by the light source. At the other end, photodiode device receives the signal which gets transformed into the forms that are redily accepted by end users. After recognizing the immense speed of LiFi, many organizations have started developing it to achieve their dominance in the market.

II. WHAT IS LI-FI TECHNOLOGY

LI-Fi is a remote optical systems administration innovation that utilizations light-emanating diodes (LEDs) for information transmissional is intended to utilize LED lights like those at present being used in numerous energy-cognizant homes and workplaces. Nonetheless, LI-Fi bulbs are furnished with a chip that balances the light vaguely for optical information transmission. LI-Fi information is communicated by the LED bulbs and got by photoreceptors. LI-Fi's initial formative models were equipped for 150 megabits-per-second (Mbps). Some business units empowering that speed have been delivered. In the lab, with more grounded LEDs and diverse innovation, specialists have empowered 10 gigabits-per-second (Gbps), which is quicker than 802.11ad. ―They can be turned here and there rapidly, which gives decent freedoms for sent data. It is feasible to encode information in the light by fluctuating the rate at which the LEDs flash on and off to give various series of 1s and 0s. 1 Most of us know about Wi-Fi (Wireless Fidelity), which utilizes 2.4-5GHz RF to convey remote Internet access around our homes, schools, workplaces and out in the open spots. We have become very subordinate upon this almost universal assistance. Yet, as most innovations, it has its restrictions. While Wi-Fi can cover a whole house, its transmission capacity is commonly restricted to 50-100 megabits each second (Mbps). This is a decent match to the speed of most current Internet administrations, yet inadequate for moving huge information records like HDTV films, music libraries and computer games. The more we become subordinate upon the cloud or our own ‗media workers to store all of our records, including films, music, pictures and games, the more we will need transfer speed and speed. In this way RF-based advances, for example, the present Wi-Fi are not the ideal way. What's more, Wi-Fi may not be the most proficient approach to give new wanted capacities, for example, exactness indoor situating and motion recognition. The utilization

of the obvious light range for high-speed data correspondence is empowered by the development of the light transmitting diode (LED) which simultaneously is at the core of the following rush of energy-productive enlightenment. Terms at the College of Oxford and the University of Edinburgh are zeroing in on equal data transmission utilizing exhibit of LEDs, where each LED communicates an alternate information stream. Different gatherings are utilizing combinations of red, green and blue LEDs to modify the light recurrence encoding an alternate information channel. In October 2011 various organizations and industry bunches shaped the Li-Fi Consortium, advance high velocity optical remote frameworks and to defeat the restricted measure of radio based wireless range accessible by abusing a totally unique piece of the electromagnetic range. The consortium trusts it is feasible to accomplish in excess of 10 Gbps, hypothetically permitting a highdefinition film to be downloaded in 30 seconds. The vision is that a Li-Fi remote organization would supplement existing heterogenous RF remote organizations, and would give critical range alleviation by permitting cell and remote devotion (Wi-Fi) frameworks to off-load a huge segment of remote information traffic.

III. WORKING OF LI-FI

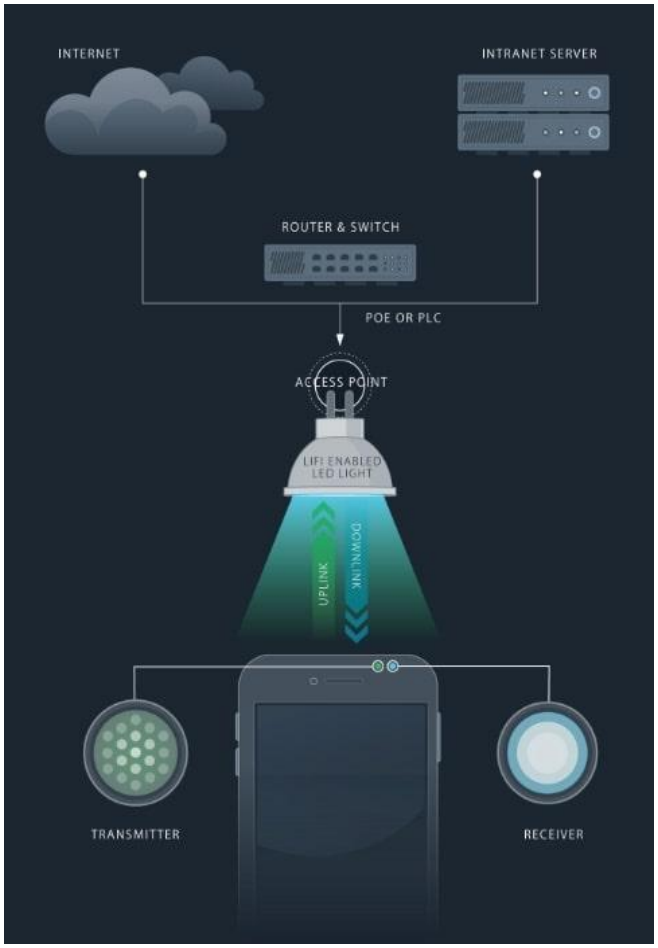

Fig 1. Working of Li-Fi

Li-Fi makes use of light through overhead lighting for the transmission of knowledge. This is possible through the utilization of a clear Light Communications (VLC) system for data transmission. A VLC system has two qualifying components:

1) The receiver side contains a photodiode in order toreceive light signals.
2) A light source equipped with a sign processing unitfor the transmission of signals.

The VLC light are often within the sort of a fluorescent bulb or a light-weight emitting diode (LED). LED light bulbs are the foremost optimum VLC light, however, since a strong Li-Fi system requires extremely high rates of sunshine output. Fluorescent bulbs emit light during a much wider band of wavelengths, which makes it a comparatively less efficient light than LED. LED, on the opposite hand, may be a light that emits light during a very narrow band of wavelengths, making it a more efficient light. LED act as a semiconductor, which implies that it can amplify light intensity and switch rapidly. This is a most beneficial quality to look for

in a VLC light.
source because Li-Fi relies on the constant stream of photons emitted as visible light for the transfer of data.
When the present applied to the sunshine source is varied slowly, the sunshine source dims up and down, which makes it unsuitable as a source of sunshine, not for the Li-Fi system, but as a device for household usage. To strike a balance between VLC light and household illumination, this current also because the optical output is modulated at extremely high speeds, making it detectable by the photodiode device and converted back to electrical current, but unperceivable by the human eye. The signals are changed over into a persistent stream of twofold structure that contain recordings, pictures, sound, text, or applications that are promptly consumable on any web empowered gadget, whenever they are gotten and demodulated. Since Li-Fi innovation stays in its relative earliest stages, there's still a lot of space for developing advancement. One proposed innovation to the prevailing technology includes creating a bidirectional communication system almost like conventional broadband and Wi-Fi. This can be done by interchanging light and infrared from a photodetector, allowing connected mobile devices to remit data to the sunshine source for an uplink. Another proposed innovation is that the re-engineering of the multi-colored RGB LEDs to send and receive data on a wider range of signals than the single-colored phosphor- coated white LED's.

IV. COMPARISON BETWEEN LI-FI AND WI-FI

Li-Fi is expected to depict obvious light correspondence innovation put on fast remote transmission. The name is procured because of the similitude to Wi-Fi.

Parameters	**Li-Fi**	**Wi-Fi**
Speed	1-3.4 Gbps	54-1 Gbps
Range	10 meters	20-100 meters
Spectrum Range	10000 times more than wi-fi	Radio Spectrum Range
Network topology	Point to Point	Point to Multi-Point
Data Transfer Medium	Use Light as a carrier	Use Radiospectrum

V. AUDIO TRANSMISSION USING LIFI TECHNOLOGY

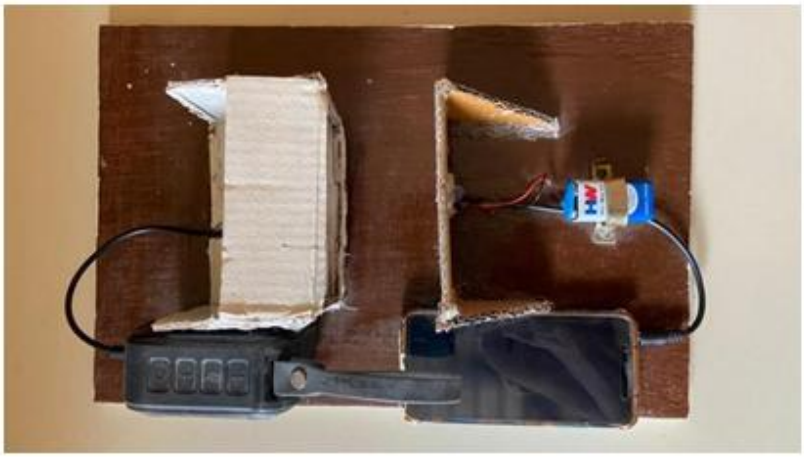

Fig 2. Audio Transmission using Li-Fi

INTRODUCTION

In Li-Fi, data is transmitted by modulating the intensity of the light, which is then received by a Photo-sensitive detector. VLC, consists of a light source as a transmitter and detector as a receiver. The loudness of the voice depends upon the intensity of the LED. The receiver section basically adapts the incoming light which is detected using a solar panel and converts to the audible sound signal with the help of speaker. This method can be made more productive by using more than one LED and passing more than one data stream at a given time. By doing this more information can be passed and hence a faster data communication is possible. In the process of an audio/sound communication through the visible light, on the transmitter side input is given by a phone, laptop etc. Then using VLC the audio is transmitted to the receiver side. After receiving the audio, the receiver

plays the audio on the speaker connected to the receiver's end and thus the audio transmission using Li-Fi is achieved successfully.

HARDWARE REQUIREMENTS

1. Input device (Phone, Laptop, etc.)
2. Audio jack
3. LED's
4. 330Ω Resistor
5. 9v Battery
6. Photo Detector (Solar Panel)
7. Speaker

VI. WORKING

At the beginning, input is necessary which is usually taken from the audio output of the Mobile Phone, Laptop or any other musical instruments. The input which is to be taken is connected to an audio jack at one end and the other end is connected to the LED's. In this step, audio signal travels from the mobile phone through the audio jack to the LED's. In Li-Fi Transmission, the most important requirement of light source is its ability to turn ON and OFF Repeatedly in very short intervals (in ns range). So we use LED's which have very low switching time. These LED's turn ON and OFF in nano second based on the Pulse signal. Since, the switching taking at a faster rate, it cannot be detected by the human eye. So it will appear as illuminating even though they are blinking. Then, the audio signal gets converted to the light signal and it transmits all the data to the receiver's end. Moving towards the receiver side, this light signal which contains all the data is adapted by the photo detector (solar panel). The transmission of data is totally dependent on LED's and the photo detector. In simpler terms, LEDs should not be too dull because then it will fail to send the entire data. Due to this, it may cause disturbance to the audio output. Also, the LEDs should not be too bright than receiving capacity of the photo detector. If this happens then the photo detector would be unable to accept the data and then it may led to no audio output. After the photo defector accepts the data, then data again gets converted from light signal to the audio signal.

BLOCK DIAGRAM

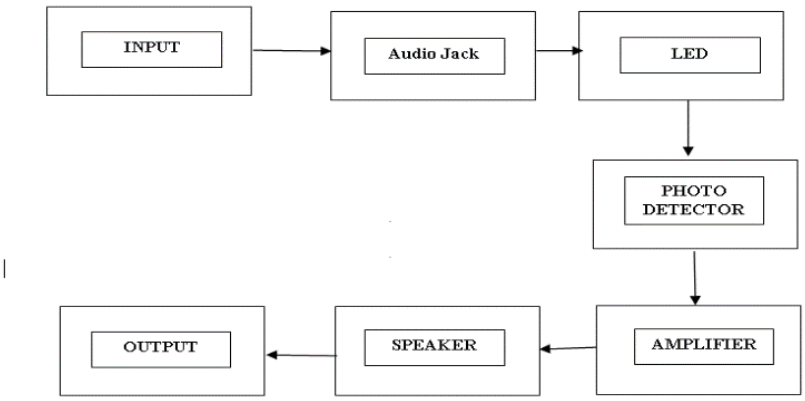

Fig 3. Block diagram

Then the data travels from the audio jack to the speaker. So at the end, the input audio given by the mobile phone gets transmitted to the speaker using VLC (Visual Light Communication) and the speaker plays the audio successfully.

VII. TEXT TRANSMISSION USING LIFI TECHNOLOGY

Fig 4. Text Transmission using Li-Fi

HARDWARE REQUIREMENTS

1. Arduino UNO
2. LDR Sensor
3. 4*4 Keypad/Regular keyboard
4. 16*2 Alphanumeric LCD
5. I2C Interface module for LCD
6. Breadboard
7. Connecting Jumpers
8. 5 mm LED

WORKING

Transmitter Side: In the transmitter part of Li-Fi communication, the keypad is used as input here. That means we'll be selecting the text to be transmitted using the keypad. Then the information is processed by the control unit which is nothing but Arduino in our case. Arduino converts the information into binary pulses which can be fed to an LED source for transmission. Then these data are fed to LED light which sends the visible light pulses to the receiver side.

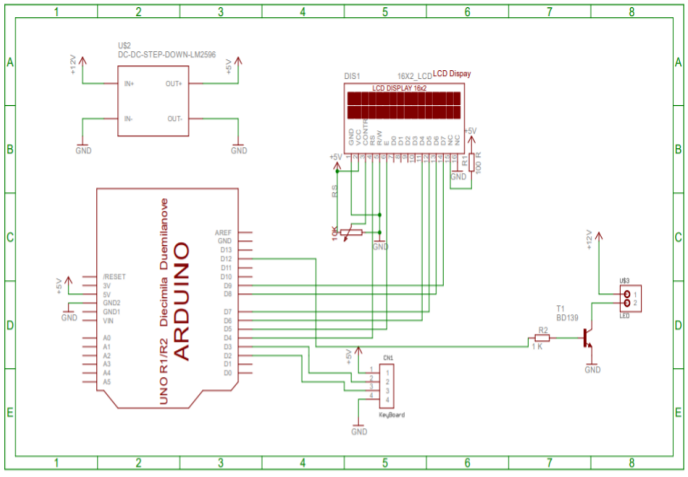

Fig 5. TX Schematics

Receiver Side: In the receiver part, the LDR sensor receives the visible light pulses from the transmitter side and converts it into interpretable electrical pulses, which is supplied to the Arduino (Control unit). Arduino receives this pulse and converts it into actual data and displays it on a 16x2 LCD display

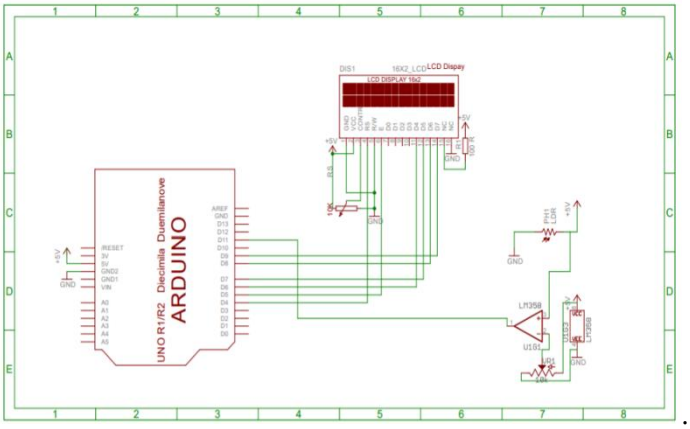

Fig 6. TX Schematics

BLOCK DAIGRAM RX AND TX

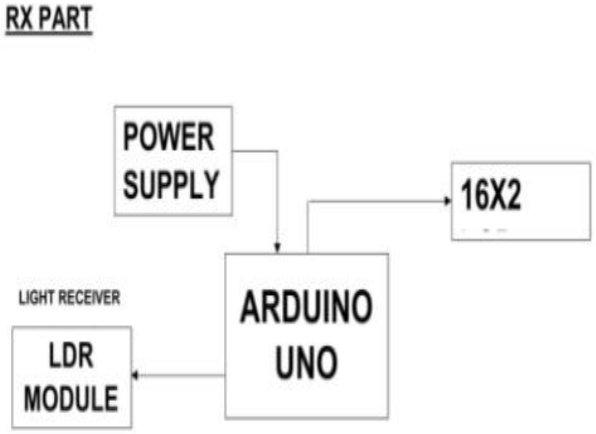

Fig 7. RX Block Diagram

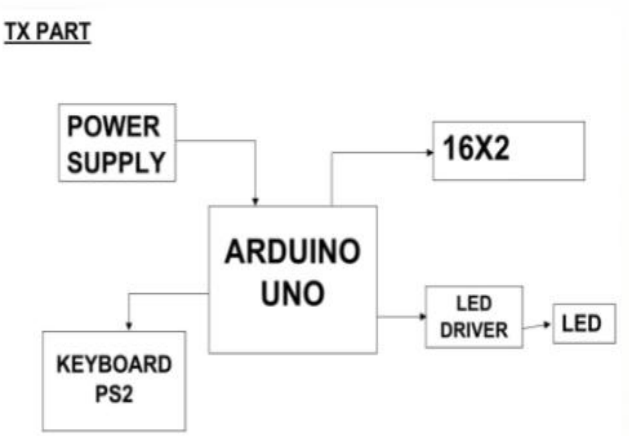

Fig 8. TX Block Diagram

VIII. CONCLUSION

Li-Fi is the pattern of today and not so distant future. It is one of the least expensive and productive methods of information move. It certainly can supplant the conventional Wi-Fi organizations and can additionally be stretched out to various stages to make it effectively open and convenient which will consequently oblige the developing requests of the expanding populace. Despite the fact that there's as yet far to make this innovation a business achievement, it guarantees an extraordinary potential in the field of remote web. Countless scientists and organizations are at present chipping away at this idea, which vows to tackle the issue of absence of radio range, space and low web association speed. By sending of this innovation, we can relocate

to greener, cleaner, more secure correspondence organizations. The actual idea of Li-Fi vows to address issues, for example, deficiency of radiofrequency transfer speed and takes out the drawbacks of Radio correspondence advancements. There are billions of lights around the world, they simply should be supplanted with LEDs ones that send information. Obvious Light Communication (VLC) is extremely less expensive to Wi-Fi on the grounds that it utilizes light as opposed to radio.

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