



DATA TRANSMISSION USING LIGHT (LI-FI)

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ABSTRACT

In modern days many people are using wireless communication with low power consumption, increase the data rate and long-range communication by increasing the no. of users. The wireless communication methods for transferring information between two or more devices by using the radio transmitters, receivers, remote controls and Li-Fi technology. Light Emitting Diodes are assuming a noteworthy part in numerous regions of our everyday life.

Li-Fi stands for Light Fidelity. Li-Fi communication is also called as the Visible Light Communication (VLC) here we use the visible light for transmitting the data, audio, text and image. It is the one of the fastest communication which compared to the Wi-Fi communication and also due to the VLC we can use different wave length for different speed of transmission.

Keywords: Li-Fi, VLC, Wi-Fi, LDR, arduino.

I. INTRODUCTION

In the era of overcrowded (data communication) world, Li-Fi is a new way of wireless communication that uses LED lights to transmit data wirelessly. Transmission of data is one of the most important day to day activities in the fast growing world. The current wireless networks that connect us to the Internet are very slow when multiple devices are connected. Also with the increase in the number of devices which access the Internet, the availability of fixed bandwidth makes it much more difficult to enjoy high data transfer rates and to connect a secure network.

The technology is very new and was proposed by the German physicist **Harald Haas in 2011 TED (Technology, Entertainment, Design) Global Talk on Visible Light Communication (VLC)**. Li-Fi is a wireless optical networking technology that uses light emitting diodes (LEDs) for transmission of data. The term Li-Fi refers to visible light communication (VLC) technology that uses light as medium to deliver high-speed communication in a manner similar to Wi-Fi and complies with the IEEE standard **IEEE 802.15.7**. The IEEE 802.15.7 is a high-speed, bidirectional and fully networked wireless communication technology based standard similar to **Wi-Fi's IEEE 802.11**.

Li-Fi is transmission of data using visible light by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. A communication system can have classified into two types that

is Wired communication and Wireless communication. Presently wireless communication uses radio waves. Spectrum is the one of the most essential requirement for wireless communication. With the advancement in technology and the number of users, the existing radio wave spectrum fails to cater to this need. To resolve this problem, we use the Li-Fi communication in this information can be transmitted within milliseconds, in this we have use led, photodiode, arduino, MOSFET transistor, LDR, resistor 4.5ohm.

VLC as coined by Prof. Harald Haas during his TED Global talk, is bidirectional, high speed and fully networked wireless communications, like Wi-Fi, using visible light. Li-Fi is a subset of visible light communications (VLC) and can be a complement to RF communication (Wi-Fi or Cellular network), or a replacement in contexts of data broadcasting. In October 2011, companies and industry groups formed the Li-Fi Consortium, to promote high-speed optical wireless systems and to overcome the limited amount of radio-based wireless spectrum available by exploiting a completely different part of the electromagnetic spectrum. A number of companies offer uni-directional VLC products which is not the same as Li-Fi. VLC technology was exhibited in 2012 using Li-Fi. By August 2013, data rates of over 1.6 G bit/s were demonstrated over a single color LED. In September 2013, a press release said that VLC systems in general, do not require line-of-sight conditions. In October 2013, it was reported Chinese manufacturers were working on Li-Fi development kits.

II. WORKING

As shown in fig.1.2, the transmitter end or sender end computer is used to transmit data which user wants to send in which an led, amplifiers, chips, arduino, & MOSFET transistor is used. This equipment's are connected to manipulate & support each other that will transmit data. In which arduino is coded to transfer text, audio, image, folders, etc.

At receiver end a photodiode is used to receive the data which has been transmitted by led. In this way the data will be transmitted by using Li-Fi. And an USB TLB convertor is used to convert the binary format data into actual data. Buffers are used for storing data temporarily. As shown in fig.1.1 the VLC spectrum which is used to monitor that the data transferred by led is received from photodiode or LDR because it's just like setting connection between them.

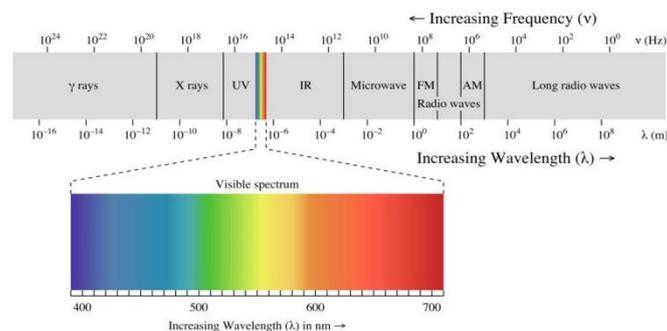


Fig :-1.1 Visibility Light Spectrum

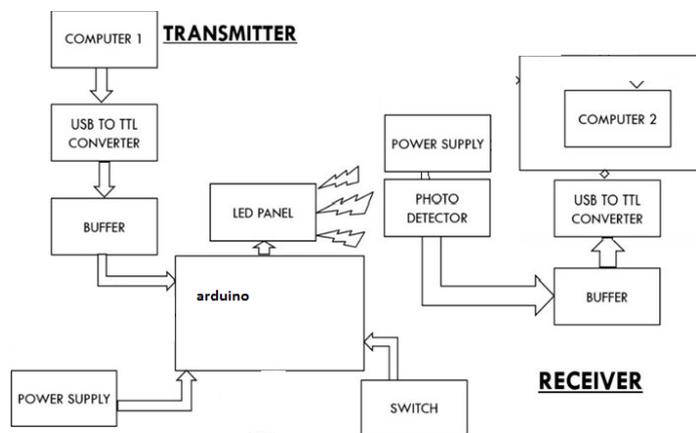


FIG:- BLOCK DIAGRAM OF LI-FI

Fig:- 1.2 Block Diagram Of Lifi

III. ADVANAGES & DISADVANTAGES

A] Advantages:

- Larger Bandwidth (10,000 Times The RadioBandwidth)
- HighEfficiency
- Moreavailability
- Highlysecure
- Education systems: It can replace Wi-Fi at educational institutions and at companies same speed intended in a particulararea.
- Medical Applications: Operation theatres (OTs) do not allow Wi-Fi due to radiation concerns. VLC can be used to accessing internet and to control medical equipment. This can even be beneficial for robotic surgeries and other automatedprocedures.
- Cheaper Internet in Aircrafts: Wi-Fi is not used because it may interfere with the navigational systems of the pilots. VLC can be used for data transmission. VLC can easily provide high speed internet via every light source such as overhead reading bulb, etc. present inside theairplane.
- Underwater applications: VLC can even work underwater where Wi-Fi fails completely, thereby throwing open endless opportunities for militaryoperations

B] Disadvantages:

- Internet cannot be accessed without a light source. This could limit the locations and situations in which Li-Fi could be used.
- Natural light, sunlight, and normal electric light can affect the data transmission speed.
- Light waves don't penetrate through walls and so Li-Fi has a much shorter range than Wi-Fi.
- A major challenge facing LI-FI is how the receiving device will transmit back to transmitter.

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IV. APPLICATIONS

- Education systems.
- Medical Applications.
- Applications in sensitive areas.
- Traffic LIGHT applications.
- Mobile connectivity.
- Street lamps.
- Military applications.

V. FUTURE SCOPE

This technology doesn't deal with radio waves, so it can easily be used in the places where Bluetooth, infrared, WIFI and Internet are banned. In this way, it will be most helpful transferring medium for us. It includes other benefits like:

1. A very wide spectrum over visible wave length range.
2. Extremely high color fidelity.
3. Instant start time.
4. Easy terminal Management.
5. Dynamic dark i.e. brightness Modulation of lamp output to enhance video contrast.
6. Trouble-free integration into existing light engine platform.

VI. CONCLUSION

This paper presents that data can be transmitted through light. If this technology is put into practical use then LED can be used to transmit wireless data and we will proceed through greener, cleaner and safer future. This can solve the issue like shortage of radio-frequency bandwidth and can be used in aircrafts or hospitals. Hence by using this speed of the data transmission rate can be increased. Security problems can be easily solved. If this technology is can be put into practical use, every bulb can be used something like a Wi-Fi hotspots to transmit wireless data. VLC gives the advantage of a using an unregulated, unlicensed part of the electromagnetic spectrum. As it is a modern technology, VLC have many challenges but apart from it is ready for implementation.

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