

OUTLOOK ON SMART WAY TO TRANSFER FILE USING LI-FI TECHNOLOGY UNDER VISIBLE LIGHT COMMUNICATION

B.Anitha Vijayalakshmi^{#1}, Ms. Narmadha Devi^{*2}, Ms. Packia selvi^{*3}, Ms. Pavina Rani^{*4},
Ms.Ramalakshmi⁵

^{#1} Associate Professor, Department of Electronics & Communication Engineering, Kings Engineering College

^{*2,3,4,5} UG Students, Department of Electronics & Communication Engineering, Kings Engineering College

Abstract Wi-Fi is great for general wireless exposure within a building, where as Li-Fi is ideal for high density wireless data coverage in cramped area and for recreating radio frequency interference issues. Wi-Fi uses radio spectrum to transmit data. Similarly, the term Li-Fi refers to visible light communication technology that uses light as medium to deliver high-speed communication. For transmission of data Li-Fi uses light emitting diodes. Li-Fi can be a new contribution in one of the competent wireless data transmission systems. It holds a great scope in future due to its excellent speed. This paper focuses the smart way of file transfer using Li-Fi technology.

I. INTRODUCTION:

Visible light communication was estimated to be the indoor wireless communication of the next generation due to the opportunity of transmitting data at a high rate. Li-Fi, as coined by Prof. Harald Haas during his TED Global talk, is bidirectional, high speed and fully networked wireless communications similar to Wi-Fi. Li-Fi is a subcategory of optical wireless communications (OWC) and can be a counterpart to RF communication (Wi-Fi or Cellular network), in replacement of contexts of data broadcasting. It is wireless and uses visible light communication or infra-red and near ultraviolet (instead of radio frequency waves) spectrum, part of OWC technology, which transmits much, more information, and has been suggested as a solution to the RF-bandwidth limitations.

The electromagnetic radiation with wave length in a particular range is interpreted by the human brain is identified as visible light. Visible light is thus by definition consist of visually-perceivable electromagnetic waves. A Wave length from 380 nm to 750 nm is covered by visible spectrum. Light Fidelity is broadcasting data through illumination by taking the fiber out of fiber optics by sending data through a LED light bulb that diverges in

intensity faster than the human eye can follow. Li-Fi is the term somehow used to label the fast and cheap wireless Communication system. Li-Fi is the optical version of Wi-Fi. Li-Fi is a recently emerged wireless technology that has the opportunity of providing efficient and best connectivity within indoor network environment. The prior spirit of this technology is that it enables us to send the information with the installed LED lights used for illumination.

II. ISSUES WITH RF TECHNOLOGY:

- a) Capacity: Wireless data is transmitted through radio waves which has limited bandwidth and expensive.
- b) Efficiency: There are 1.4 million cellular radio base stations that consume massive amount of energy. Therefore efficiency of such base stations is only 5%.
- c) Availability: It is not advisable to use mobile phones in aero planes and at places like petrochemical plants and petrol pumps.
- d) Security: Radio waves can penetrate through walls. They can be intercepted. If someone has knowledge and bad intentions, they may misuse it [1].

The further promising method used to transmit data is achieved by visible light communication technology. The need to use VL as medium is based on: Low implementation cost – by simple installation procedures and fixture of LEDs. Low maintenance cost – by low power consumption and long life-time of LEDs. Visible light communication system is safe for human as it has harmless frequency. The concerns of cell mutation could be minimized.

III VISIBLE LIGHT COMMUNICATION:

The part of the VLC spectrum which is visible to the human eye is the visible light spectrum. The visible light is the electromagnetic radiation in this range of wavelengths. The band width of this spectrum links to 430-770 THz. Imagine that how a flash light can be used to send the mores code. If the flash` light is made on and off very quickly according to the binary data of user requirement we get a system wherein there is communication plus illumination. The low bandwidth problem in RF communication is resolved in VLC because of the availability of the large bandwidth as illustrated in Fig. 1. The VLC receiver only receives signals if they reside in the same room as the transmitter, therefore the receivers outside the room of the VLC source will not be able to collect the signals and thus, it has the resistance to security issues that occurs in the RF communication systems. As a visible light source can be used both for radiance and communication, therefore, it saves the further power that is required in RF communication. Keeping in visualization the above benefits, VLC is one of the hopeful candidates because of its features of non-licensed channels, high bandwidth and low power consumption.

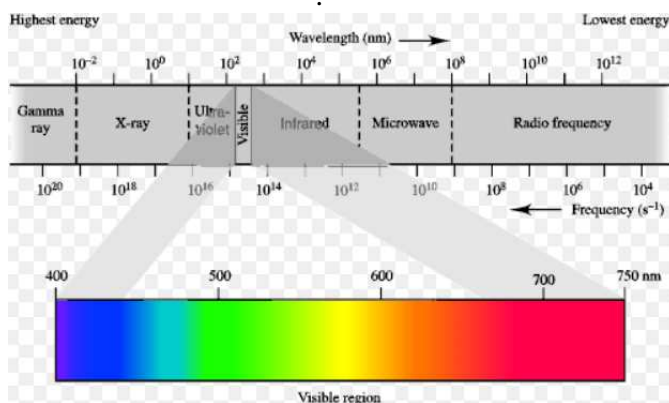


Fig.1 Visible light spectrum

A. Feasibility of VLC technology

Global Positioning System (GPS) is a famous positioning system nowadays. In fact, the visible light communication system could be installed into the street lamps. The blind spots problem in GPS could be tackled. Also, the errors in detecting the actual position could be reduced. LED commercial displays can be seen everywhere. The displays could be used as the wireless communication transmitters [2]. As there is a rapid growth in population, the increase in the number of devices accessing the wireless internet, the airwaves becoming increasingly clogged, making it more and more difficult to get a reliable and high-speed data

transmission. Li-Fi may solve the above issues and overcome the shortage of radio frequency bandwidth and also allow internet to be used in the places where traditional radio based wireless communication isn't allowed such as aircraft or hospitals [3]. In Wi-Fi reduction in speed and the jamming take place which is today's problem as the number of users are increasing and also waves create a harmful effect for living things. This jamming problem get reduces to a great extent by using Li-Fi and such that we can precede towards the cleaner, greener, safer and brighter future without radio wave. Li-Fi using LED's can be encouraged to produce a safe and green technology. Li-Fi will bring out Li-Fi products for firms installing LED-lighting systems. In future data for laptops, Smartphone's, and tablets can be transmitted through the light in a room by using Li-Fi [4].

B. Li-Fi technology:

Li-Fi is a high hustle bi-directional fully linked, visible light wireless communication system and is analogous to Wi-Fi, which uses radio frequency for communication. The Wi-Fi signals have the problem of interference with other RF signals. The goal of Li-Fi Consortium is to foster the Development and distribution of optical wireless technologies such as communication, navigation, natural user interfaces and others. Li-Fi could free up bandwidth, especially as much of the infrastructure is already in place. There are around 14 billion light bulbs worldwide, they just need to be replaced with LED ones that transmit data," says Haas. "We reckon VLC is a factor of ten times cheaper than Wi-Fi." Because it uses light rather than radio-frequency signals, VLC could be used safely in Aircraft, combined into medical devices and hospitals where Wi-Fi is banned, or even underwater, where Wi-Fi doesn't work at all. Li-Fi technology uses a part of the electromagnetic spectrum that is still not greatly consumed. The Visible Light Spectrum is in fact very much part of our lives for millions and millions of years and does not have any major ill effect. Moreover there is 10,000 times more space available in this spectrum and just including on the bulbs in use, it also multiplies to 10,000 times more availability as an infrastructure, globally. The comparison between Wi-Fi and Li-Fi is given below. Table 1: Wi-Fi Vs Li-Fi

Parameters	WI-FI	LI-FI
Speed of data transfer	180Mbps	1Gbps
Medium of data transfer	Radio spectrum	Light source
Spectrum of range	Greater than 10000	Lesser than light
Cost	High	low
Network topology	Point to point	Point to point
Operating frequency	Hundreds of Tera Hz	2.4Ghz
security	Good	excellent

Parameters	WI-FI	LI-FI
Speed of data transfer	180Mbps	1Gbps
Medium of data transfer	Radio spectrum	Light source
Spectrum of range	Greater than 10000	Lesser than light
Cost	High	low
Network topology	Point to point	Point to point
Operating frequency	Hundreds of Tera Hz	2.4Ghz
security	Good	excellent

Light emitting diodes (LEDs) can be switched on and off faster than the human eye can identify since the operating speed of LEDs is less than 1 μs, thereby causing the light source to appear to be constantly on. This invisible on-off activity allows data transmission via binary codes. Switching on an LED is binary '1', switching it off is binary '0'. It is possible to encode data in light by varying the rate at which LEDs flicker on and off to give different strings of 1s and 0s. Modulation is so rapid that humans cannot notice it. A light sensitive device (photo detector) then collects the signal and converts it back into original data.

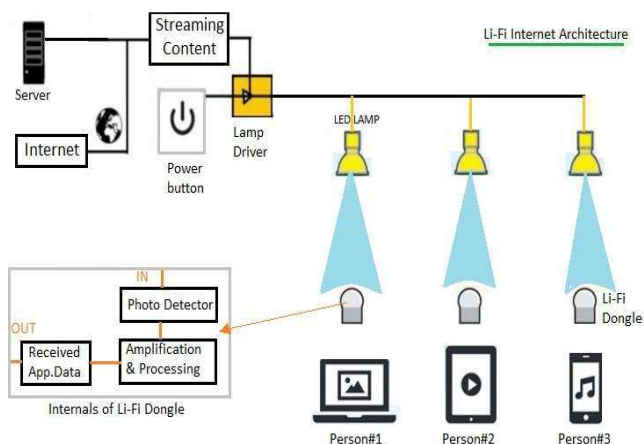


Fig. 2: Li-Fi module

IV SYSTEM IMPLEMENTATION:

Block Diagram for transmitter:

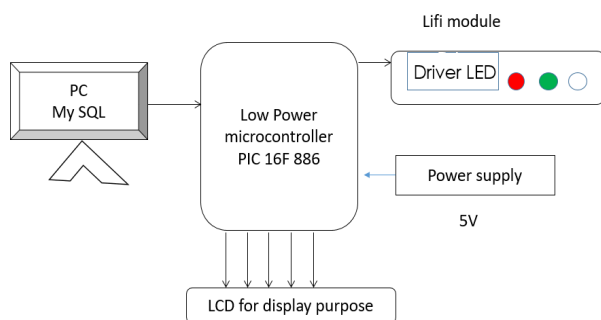


Fig.3 Transmitter module

Transmitter section consists of normal PC where the data input is given. The given input is encrypted by Manchester coding. The encrypted data is stored in the low power microcontroller. The stored data in the microcontroller is then fed to the Li-Fi module which consists of driver circuit and LED. By varying the current given to the LED the optical output also varies at high speed. Thus the binary data from PC is given to Li-Fi module where electrical signal is converted into light signal.

Block Diagram for Receiver:

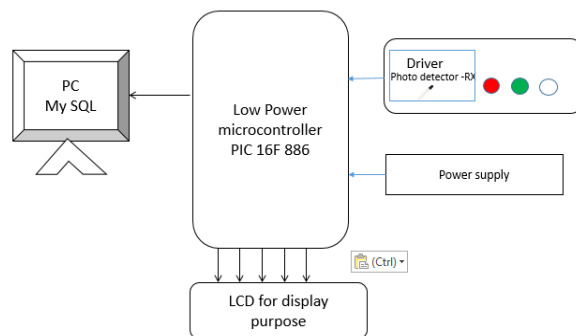


Fig.4 Receiver module

Then the light signal is received into the receiver side which consists of photo detector. It converts light signal to electrical signal. Then the binary data from photo detector is given in to PC where the decryption is done. Thus the user can view the original form of files. The figure 5 shows Li-Fi module for data transmission. In our work video file transmission at a rate of 9.6 kbps has been achieved.



Fig.5 Li-Fi module for data transmission

V CONCLUSION

The concept of Li-Fi is now inviting a great deal of interest. It offers a genuine and very efficient substitute to radio-based wireless. Li-Fi is the optical wireless communication for data, audio and video streaming in LEDs, this type of new invention can be stimulated to produce a safe and green technology. Li-Fi is still in its incipient stages and thus offers tremendous scope for future research and innovation.

REFERENCE

1. Pushpendra Verma, Dr. Jayant Shekhar, Preety and Dr. Amit Asthana ,,"LIGHT-FIDELITY(LI-FI): TRANSMISSION OF DATA THROUGH LIGHT OF FUTURE TECHNOLOGY", International Journal of Computer Science and Mobile Computing, Vol.4 Issue.9, September- 2015.
- 2.Sylvester C.S., "VISIBLE LIGHT COMMUNICATIONS", International Journal of Advanced Computational Engineering and Networking, ISSN: 2320-2106, Volume-4, Issue-10, Oct.-2016.
3. NIKSHEP. K N and SOWMYA. G, "VOICE AND DATA COMMUNICATION USING Li-Fi", International Journal of Advanced Computational Engineering and Networking, Volume-4, Issue-10, Oct.-2016.
4. Mr. Shailendra Yadav, Mr. Pradeep Mishra, Miss. Minakshee Velapure, & Prof.P.S.Togrikar, "LI-FI Technology for Data Transmission through LED", Imperial Journal of Interdisciplinary Research (IJIR) Vol-2, Issue-6, 2016.