



An Overview to Future Wireless Technology in the Field of Data Communication

¹Prof. Ashwini F. Kokate, ²Pankaj N. Bhivgade, ³Khemendra N. Katre, ⁴Dipali J. Hatwar, ⁵Pranay S. Madame

¹HOD, ^{2,3,4,5}Student, Department of Electrical Engineering, Madhukarrao Pandav College of Engineering, Bhilewada, Bhandara, Maharashtra, India

ABSTRACT

Li-Fi is a wireless communication system in which light is used as a signal instead of traditional radio frequency as in Wi-Fi. Li-Fi is a technology that uses Light Emitting Diodes to transmit data wireless form. Li-Fi is a form of Visible Light Communication. Visible Light Communication uses rapid pulses of light to transmit information wirelessly that cannot be detected by the human's eye. This paper demonstrates the working of Li-Fi by stimulating a simple circuit which give us the required output. Li-Fi technology was first demonstrated by "Harald Hass", a German Physicist from the University of Edinburgh.

Key words: Li-Fi, Wi-Fi, LED Light Emitting Diode), VLC (Visible Light Communication).

INTRODUCTION

Li-Fi stands for "Light Fidelity". It is a VLC (Visible Light Communication), technology developed by team of scientists including *Dr. Gordon Povey, Prof. Harald Hass and Dr. Mostafa Afgani* at University of Edinburgh Li-Fi is now part of Visible Light Communication (VLC) PAN IEEE802.15.7 Standard. Li-Fi is typically implemented using LED light bulbs. These devices are normally used for illumination by applying a constant current through the LED, Li-Fi is the term have been used to label the fast and cheap wireless communication system, which is the optical version of Wi-Fi. Li-Fi is light based Wi-Fi that is, it uses light instead of radio waves to transmit information. Data from the internet and the local network is used to modulate the intensity of LED light source in a way undetectable to the human eye. The photodetector picks up the signal, which is converted back into a data stream and sent to the client. The client can communicate through its own LED output or over the existing network.

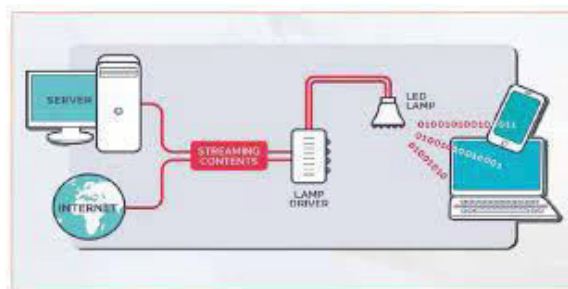


Fig. 1 Overview of Li-Fi Technology

WORKING OF LI-FI

Data from the internet and the local network is used to modulate the intensity of LED light source in the way of undetectable to the human eye. The photodetector picks up the signal, which is converted back into the data stream and sent to the client. The client can communicate through its own LED output or over the existing network. Operational procedure is very simple. If the LED is on mode, you transmit a digital 1, if is off mode you transmit 0. The LED's can be switched on and off very quickly, which gives nice opportunities for transmitting data. Hence all that is required is some LED's and a controller that code data into those LED's. We have to just vary the rate at which the LED's flicker depending upon the data we want to encode. Thus, every light source will work as a hub for data transmission.

COMPARISON BETWEEN LI-FI AND WI-FI

PARAMETERS	LI-FI	WI-FI
Speed	Up to 1 GBPS	100 to 150 GBPS
Range	Based on LED	10 Meters
Data Density	Very high	Low
Security	High secure	Less secure
Frequency	Light does not require frequency	2.4GHz
Bandwidth	High due to broad range of spectrum	Low
Environmental Impact	Low	High
Ecological Impact	Low	High
Power Consumption	Less	More

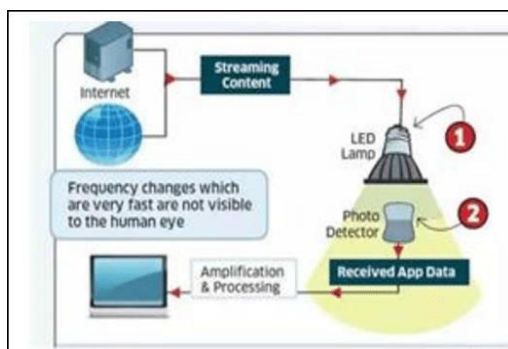


Fig. 2 Working of Li-Fi

On one end all the data on the internet will be streamed to a lamp driver when the LED is turned on the microchip converts the digital data in form of light sensitive device (photo detector) receives the signal and converts it back into original data. This method of using rapid pulses of light to transmit information wirelessly is technically referred as Visible Light Communication.

LIMITATION

- 1) Light can't pass through object
- 2) Interferences from external light sources like sun light, normal bulbs, and opaque materials in the path of transmission will cause interruption in the communication.
- 3) High installation cost of the VLC systems.
- 4) A major challenge facing Li-Fi is how the receiving device will transmit back to transmitter.
- 5) Li-Fi cannot work under the sunlight, because if we use LIFI in sunlight then sunlight will block the path of the light ray generated by LEDs bulbs.
- 6) Interference from external sources like sun may cause interruption in the path of transmission of data in LIFI.
- 7) Li-Fi cannot pass through solid object like walls and obstacles.

APPLICATIONS

- 1) RF Spectrum Relief: Excess capacity demands of cellular networks can be off-loaded to Li-Fi networks where available. This is especially effective on the downlink where bottlenecks tend to occur.
- 2) Smart Lighting: Any private or public lighting including street lamps can be used to provide Li-Fi hot-spots and the same communications and sensor infrastructure can be used to monitor and control lighting and data.
- 3) Mobile Connectivity: Laptops, smart phones, tablets and other mobile devices can interconnect directly using VLC. Short range links give very high data rates and also provides security.
- 4) Hazardous Environments: VLC provides a safe alternative to electromagnetic interference from radio frequency communications in environments such as mines and petrochemical plants.
- 5) Hospital & Healthcare: VLC emits no electromagnetic interference and so does not interfere with medical instruments, nor is it interfered with by MRI scanners.
- 6) Aviation: Li-Fi can be used to reduce weight and cabling and add flexibility to seating layouts in aircraft passenger cabins where LED lights are already deployed. In-flight entertainment (IFE) systems can also be supported and integrated with passengers' own mobile devices.
- 7) Underwater Communications: Due to strong signal absorption in water, RF use is impractical. Acoustic waves have extremely low bandwidth and disturb marine life. Li-Fi provides a solution for short-range communications.
- 8) RF Avoidance: Some people claim they are hypersensitive to radio frequencies and are looking for an alternative. Li-Fi is a good solution to this problem.
- 9) Location Based Services (LBS): Highly accurate location-specific information services such as advertising and navigation that enables the recipient to receive appropriate, pertinent information in a timely manner and location.
- 10) Toys: Many toys incorporate LED lights and these can be used to enable extremely low-cost communication between interactive toys.

CONCLUSION AND FUTURE SCOPE

On implementing this technology, it is possible to use every light as hotspot, which produces a safe environment as possible. As waves are hazardous to living creatures and leads to endangering of birds, we try to reduce this complication using Li-Fi which works on visible light frequency and does not harm the nature. And the other advantage of Li-Fi is reduction in the power makes diagnosis faster than and allow to access internet along with the radio waves-based devices. There are disadvantages of Li-Fi technology that is there should be a particular line of sight and also depending on the bulb used efficiency differs. So with the implement of this technology, it will possible to solve issues such as the shortage of radio frequency bandwidth and also allow internet where in traditional radio based wireless is not allowed such as aircraft and hospital.

REFERENCES

- [1]. <http://en.wikipedia.org/wiki/Li-Fi>.
- [2]. www.google.com (Google searchengine).
- [3]. <http://ieeexplore.ieee.org>
- [4]. *Harald Haas*, Wireless data from every light bulb, TED Global, Edinburgh.
- [5]. en.wikipedia.org/wiki/visible_light_communication.
- [6]. *M. Thanigavel*, “Li-Fi Technology in Wireless Communication”, International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue.
- [7]. *Al-Janabi, Hussam & Jameel Hadi, Hadi*. 2017. The Characteristic of LiFi Technology Comparing with Wi-Fi. International Journal of Computation and Applied Sciences. 2. 51- 56.10.24842/1611/0025.