



## A Review on (LI-FI) Light Fidelity Enabled over IoT

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**ABSTRACT:** As per the growing development of wireless communication, the number of devices accessing the internet has reached a new level. Li-Fi is a wireless communication system in which emitting light is applied as a carrier wave alternatively of traditional radio frequency as in Wi-Fi. Depending on the type of deployment and application, a benefit of Li-Fi is the capability of LED light bulbs to provide both radiation and network connectivity simultaneously and seamlessly. Li-Fi is a technology that uses light emitting diodes to transmit data wirelessly. Li-Fi is a form of Visible Light Communication (VLC). Li-Fi technology is a ground-breaking light based communication technology, which makes use of light waves instead of radio wave technology to deliver data..

**KEYWORDS:** Li-fi, Wi-fi, IOT, LED(Light Emitting Diode).

### INTRODUCTION:

Li-Fi stands for 'Light Fidelity'. Li-Fi uses light emitting diodes (LEDs) to deliver networked, mobile-capable, high-speed communication. Li-Fi (Light Fidelity) is a light based Wi-Fi that basically uses visible light communication instead of radio waves. As light travels faster than the radio waves, it can be used to transfer the data around 250 times more than the high speed broadband. This technology uses only light bulbs in order to transmit data. The reason behind that it is very efficient and low cost. Generally all the bulbs can be used for transmission of data that can lead to inefficient way of switching ON and OFF of the light bulbs because most light bulbs uses filaments which makes a small delay while glowing.

### WORKING AND MECHANISM OF LI-FI TECHNOLOGY:

The major components of this technology are LED light bulbs and a photo detector. LED bulbs are used to transmit data and the photo detector is used to detect the flash light from the LEDs. Initially the data that we want to transmit are encoded to binary

0's and 1's. The binary digits are then fed into LED bulbs. When LED light is switched ON, the binary

0's and 1's are transmitted via LED flash. These flashes are then detected by the photo detector. The photo detector transfers the binary data for further amplification in order to decode the binary digits. Finally the decoded data is transferred to destination computer device. Li-Fi could lead to everything electronic being connected to the Internet with the lights on the electronics being used as Internet access points.

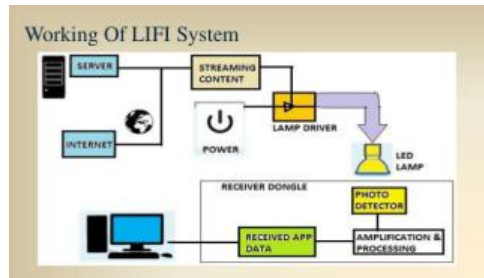


Fig .1 Working of LIFI

Since LED light bulbs and other applications for LEDs are becoming ubiquitous, expected to minimum cost and a locative efficiency over other light sources, the number of LiFi enabled devices and types of applications are vast, in both residential and commercial, transportation, and government locations.

Light fidelity, like Wi-Fi, provides devices such as computers, smartphones, and printers, televisions, speakers, headphones, and a large number of devices comes under the Internet of Things (IOT) support, to communicate bi-directionally without the use of radio frequency waves and without intrusion.

#### **DOMICILE OF LIFI:**

##### **LIFI ON AIRCRAFT:**

Airlines can put VLC and Light fidelity technology for deliverance of broadband and media content on aircraft—to increase data rates, eliminate wiring, reduce weight, and eliminate the risk of RF intervention with avionics. In addition to providing internet access to passengers on on board, Airlines now deliver movies, games, and other content to passenger screens, which typically use large amounts of wiring. Not only is the existing installation of such wiring costly, it also adds weight to aircraft, which collisions fuel economy and flight range for years. Visible Light Communications and imperceptible light communications can address this by issuing quicker transmission speeds, less wiring and equipment, and also improve safety by avoiding the use of potentially disorderly RF intervention on critical aircraft control systems.



Fig .2.1 Lifi on aircraft

### **LIFI ON RAILWAYS:**

Train stations and other mass transfer locations can use Visible Light Communications to contact with trains, trolleys, and other mass transit equipment—while avoiding RF interference and crowding issues. Firefly's point to point and point to multi-point VLC bridges can be installed on train stations and trains/trolleys to provide data and multimedia transfer, or operational information.



Fig .2.2 Lifi on railways





### ***LIFI ON POS (POINT OF SALE SYSTEM):***

Firefly's location-based transmitters and receivers are perfect for ideal nature. Information can be transmitted to performs within a store, kiosks, television monitors, and other devices in real-time and without anxiety about radio congestion and interference. Since VLC transmissions are accurate and location-based, information is deliverer able exactly to where it should be and at the correct time. Motion discernment features can even alter the information based on movement of people or equipment within the retail environment.



Fig .2.3 lifi on Pos

### ***LIFI ON UNDERWATER COMMUNICATION:***

The modern methods of transmitting data underwater are not efficient due to elements such as multi-path propagation, time variations of the channel, and strong signal attenuation, especially over long distances. previous solutions, used for military communications, or for diver-to-diver communications, perform at very small data rates and typically use acoustic waves instead of electromagnetic waves. The most familiar method of getting communications underwater is via the use of hydrophones, microphones form on a piezoelectric transducer. Underwater modems rely on acoustic technologies that limit speeds to a fraction of terrestrial wireless systems. Visible Light Communications ensures a modern method for underwater communications.

Fig. 2.4 Visible Light Communications can transmit underwater, unlike radio frequency devices





## PROPOSED WORK:

### IOT (INTERNET OF THINGS)

Internet of things is a system of interconnected computer devices, mechanical devices with separate identifiers and the talent to transfer data without is in need of man-computer interaction." The Internet of Things revolves around increased machine-to-machine communication; it's built on cloud computing and networks of data-gathering sensors; it's mobile, Effective, and an instant connection; and they say it's going to make each thing in our lives from streetlights to seaports "smart."

The Internet of Things is a system of interconnected computing devices, mechanical and digital machines, objects, animals, or people that are provided with unique identifiers and the ability to transfer data over a network without requiring man to man or man-to-computer interaction.

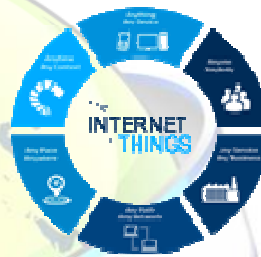


Fig .3 Internet of things

As the current scenario for IoT devices increase and sensors are added to more and more things and places, faster and larger data transmission will be required. The internet of Things is a world in which all aspect of devices, from smart phones and tablets to refrigerators and thermostats, can share data freely among themselves via the Internet and offer : unheard of control over environment .

Since radio frequency spectrum and wired connectivity are unsuitable and more costly, VLC is an ideal solution for such deployments en masse.

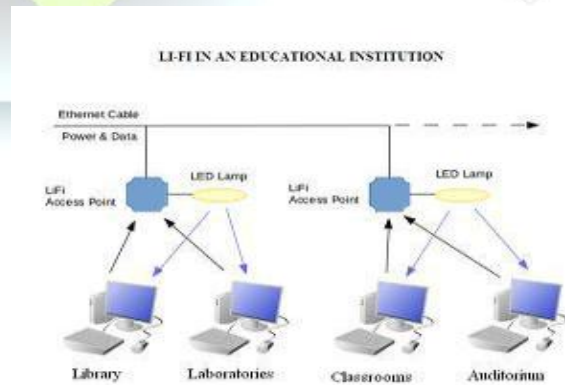


Fig .3.1 Lifi over in educational institution

We propose the usage of Li-Fi in all educational institutions that provides better connectivity.



This technology provides connectivity to the whole institution with lower cost and at high speeds. The various places such as labs, libraries, classrooms and cafeterias can act as Li-Fi hotspots permitting the students to stay connected to the entire world of information. The process of implementing in an institution involves the following steps:

- Replacing all existing light fixtures with LEDs.
- Interfacing LEDs with the existing Ethernet connection.
- The transceiver is connected to all the devices, which access internet.

#### ***APPLICATIONS OF IOT ENABLED BY LI-FI:***

- Downloading notes from blogs of teachers
- Interactive Classroom with Interconnected devices.
- Sharing of resources with the entire class.
- Downloading of resources from various websites.
- Laboratories can act as Li-Fi hotspots.
- MOOCs can be easily cast to the students.

#### ***ADVANTAGES OF LI-FI TECHNOLOGY:***

##### ***HIGH SECURITY:***

As visible light waves cannot penetrate through walls, the data cannot be intercepted, thus providing secured communication.

##### ***HIGH TRANSMISSION RATE:***

As this technology uses LED light bulbs for data transmission, the speed of transmission rate takes place at the rate of 9 GBPS.

##### ***FREE TO USE:***

Visible lights are safe to use from health point of view, rather than using RF that can lead to human disorders.

##### ***APPLICABLE UNDER SEA WATER:***

Since light can pierce under large density water, Li-Fi can be used to transmit the data under sea water which replaced Wi-Fi as radio waves are easily engross in by water.



### ***LIMITATIONS:***

#### ***INEFFICIENT USAGE:***

As light cannot penetrate through solid objects, members residing in other part of room or building cannot access the same network.

#### ***DIFFICULTY TO PREDICT TRANSCEIVER:***

The major challenge of Li-Fi technology is to predict how the receiving device will transmit data to transmitter.

#### ***EXTERNAL DISTURBANCE:***

Interferences from external light sources like sunlight may cause interruption in the path of data transmission.

### ***CONCLUSION:***

As LED light bulbs are the cheapest source for visible light communication, they can be practically implemented for Li-Fi technology to transmit data at very high speed, providing illumination and communication at very low cost that will tend us to move towards a cleaner, greener, safer and a bright future.

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