

# Transmission of Data Using Li-Fi Technology

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## ABSTRACT

Now a day's everyone is using internet for highly skilling their task through wired or wireless network. As gradually number of users are increased in wireless network their requirement increases, due to that speed is decreases proportionally. The speed of Wi-Fi is 150mbps which is insufficient for the desired users. This is a limitation of Wi-Fi hence we introduce the concept of Li-Fi. The data can send through illumination—light rays by sending over a LED light bulb that varies in intensity faster than the human eye can follow it's the same idea behind infrared remote controls but far more powerful. In this paper we proposed Li-Fi which is very efficient and alternative to radio based wireless. *It has the chance to replace the traditional Wi-Fi as this concept promises to solve issues such as the lack of radio-frequency bandwidth and the disadvantages of Wi-Fi.*

**Keywords:-** Wi-Fi(Wireless-Fidelity), Li-Fi(Light-Fidelity), LED(Light Emitting Diode), LoS (Line of Sight) and VLC(Visible Light Communication) etc.

## I. INTRODUCTION

Transfer of data from one side to another side is one of the most important daily activities. The current wireless radio networks that connect us to the internet is slow when multiple devices are connected. As the number of devices decreases that access the internet increases ,because of the fixed bandwidth available makes it very difficult to enhance high data transfer rates and for connecting to a secure network. But the radio waves are just a smallest part of the spectrum which is available for data transfer. We overcome this problem is by the use of Li-Fi. Li-Fi stands for Light-Fidelity. Li-Fi is used to transmit data through light by taking the fiber out of fiber optics by sending data through an LED light bulb which varies in intensity which the human eye can follow. Li-Fi is the term some have used for fast and cheap wireless communication system, which is optical translation of Wi-Fi. Li-Fi uses visible light for data transfer. The idea of Li-Fi was introduced by a German physicist Harald Hass, which he refers as data transferred through light source. The term Li-Fi was first used by Haas in his technology, entertainment, and design Global talk on visible light communication. According to Hass, the light, which is referred to as D-Light can be used to produce data rates larger than 10 megabits per second which is faster than average broadband connection. Li-Fi can play a major role in overcome the problem which the current wireless systems faces. It adds a new and fresh bandwidth of visible light to the currently available radio

waves for data transfer. It offers larger frequency band (300 THz) as compared to that available in RF communications (300GHz).The data coming through the visible spectrum will help to reduce risk concerns of the electromagnetic waves that come from Wi-Fi could adversely affect our health. The Li-Fi can be the technology for the future where data for laptop, smart phones.

## II. EXISTING SYSTEM

Wi-Fi is a technology which is used for an electronic device to exchange data or remain wirelessly connected to the internet by using radio waves. The Wi-Fi stands for Wireless Local Area network communication technology. Which is related to the IEEE802.11 of wireless networking standards. Optical wireless technologies called visible light communication (VLC) are more recently referred to as Li-Fi, offers an entirely new paradigm in wireless technologies in terms of communication speed, flexibility and usability. LEDs (Light Emitting Diodes) are recognized in the terms of green lighting resource because they are very energy efficient and contain no hazardous materials such as mercury emitted by fluorescent lamps. The LEDs are the source of light that are used in equipment, electronic devices, and consumer products. Their uses variants in terms of signalling, signage and illumination. These are used because of their small size,

versatility and most important feature is that it is the high energy efficiency over other illuminating sources. Recent emerging advancement in LED technology made LED to be the preferred choice for indoor and outdoor lighting applications. The feature of LEDs is the ability to switch on and off thousands of times per second. This switching is at very high ultra-speed that a human eye can detect, that the light appears to be constantly on. This capability makes it suitable for many purpose. This technology can also be used to transmit a signal even when the light is off. These signals are emitted from the LEDs in the form of binary code off means 0 and on means 1.

### III. PROPOSED SYSTEM

The important part of the Li-Fi technology is the high power LED lights, led can be turned on & off quickly because the reaction time of the LED is gives within 1 microsecond which cannot be detected by the human eye this will appear to be remains beam of light. This change from on state to off state in high frequencies enables the data transmission. Binary states are when On states '1' and off states '0' the data can be encoded and modulation techniques can be done faster than the human eye can notice it. A photo sensor can be used to receive the transmitted data from the light and produces the original data .This method receives the pulses of light and decodes it into the stream of data which is referred as VLC (visible light communication).The components used into the Li-Fi communication purposes are Led lights or glowing light source and the photo detector. The light intensity of the LED and florescent bulb can be controlled by modifiable the current applied to the light source. The use of florescent lamps will help in generating the 10megabites per second speed of data transfer but the light source provides the transmission speed of 500mb/s which is more faster reply than that of blossoming light that's why the LED (Light Emitting Diode) lights are chosen to perform the visual light communication

### IV. ARCHITECTURE

Li-Fi architecture consists of LED (Light Emitting Diode), arduino and Li-Fi units. The LED lamp is connected with Li-Fi Units and LED lamp used to connect to the data network via a standard Ethernet port. The USB (Universal Serial Bus) cable are used for connecting cables of category 5. Category 5 cables (Cat 5) is a twisted pair cable for carrying signals. This type of cable is used for computer networks such as in Ethernet. The cable is used to provide performance of up to the level of 100 MHz and

it is most preferred in 10BASE-T, 100BASE-TX (Fast Ethernet), and 1000BASE-T (Gigabit Ethernet).Cat 5 is suitable to carry other signals such as telephony and video. The Li-Fi encode data and transmit it by modulating the light intensity. The LED units receive and decode the uplink signal using infra-red detectors and optics. The protocol stack enables seamless handovers between PCs, along with multiple accesses at each individual PCs, creating an indoor network providing with high-speed wireless access. Creating an indoor cellular network providing ubiquitous computing with high-speed wireless access.

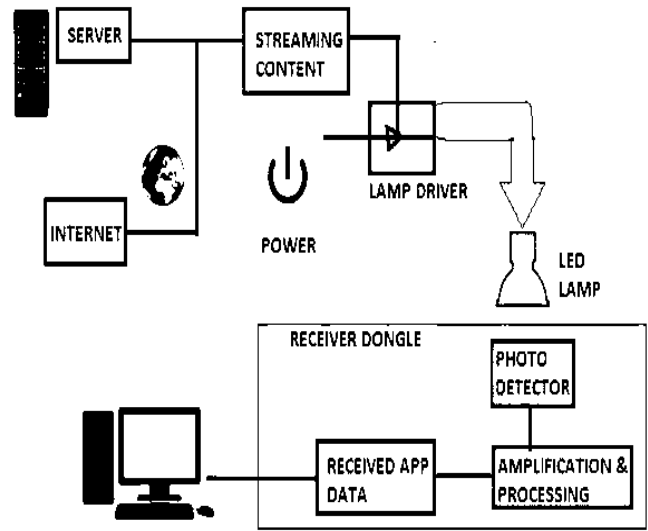


Fig1:-Block diagram of LI-FI

### V. WORKING OF LI-FI

A new generation of high brightness light-emitting diodes forms the core part of light fidelity technology. The logic is very simple. If the led is on, a digital 1 is transmitted. If the led is off, a digital 0 transmitted. These high brightness led can be switched on and off very quickly which gives use very nice opportunities for transmitting data through light the working of li-fi is very simple. There is a light emitter on one end, for example, a led, and a photo detector (light sensor) on the other. The photo detector registers a binary one when the led is on; and a binary zero if the led is off. To build up a message, flash the led numerous times or use an array of lends of perhaps a few different colours, to obtain data rates in the range of hundreds of megabits per second. For TEXT we use CAESAR CIPHER ALGORITHM.

## **VI.DISADVANTAGES OF WI-FI**

The following are the basic issues with radio waves:

- 1) Capacity: Wireless data is transmitted through radio waves which are limited and expensive and it has a limited bandwidth since the rapidly growing world and development of technologies like 3G and 4G and so on we are running out of spectrum.
- 2) Efficiency: There are 1.4 million radio base Stations that consumes massive amount of energy. Most Of the energy is used for cooling down the base station instead of transmission. Therefore efficiency of such base stations is only 5%.
- 3) Availability: Availability of radio waves is a big concern. It is not advisable to use mobile phones in aero planes and at places like petrochemical plants and petrol pumps.
- 4) Security: Radio waves can penetrate through walls. They can be intercept. If someone has knowledge And bad intentions then they may misuse it. This causes a major security concern for Wi-Fi.

## **VII.ADVANTAGES OF LI-FI**

Li-Fi technology is based on light source for the transfer of data. The transfer of the data can be with the help of all kinds of light and no matter which part of the spectrum they belong. That is, the light can belong to the invisible, ultraviolet or the visible part of the spectrum. The speed of the communication is more than sufficient for downloading movies, games, music and all in very less time. Li-Fi removes the limitations that have been put on the user by the Wi-Fi.

- 1) Capacity: The Light has 10000 times wider bandwidth than radio waves. Light sources are already installed. So, Li-Fi has better capacity and also the equipment's are already available.
- 2) Efficiency: Data transmission using Li-Fi is Cheap because LED lights consume less energy and are highly efficient.
- 3) Availability: Availability is not an issue as light sources is present everywhere. There are billions of light bulbs worldwide; they just need to be replaced with LEDs for proper transmission of data.
- 4) Security: Light waves do not penetrate through walls. So, they can't be intercept and misused.

## **VIII.APPLICATIONS OF LI-FI**

There is numerous applications of this technology stating from public internet access through street lamps to auto-piloted cars that communicates through the headlights.

Applications of Li-Fi can extend in areas where the Wi-Fi technology lacks its existence in medical technology, power plants and various other areas. Since Li-Fi uses just the light so it is used safely in aircrafts and hospitals where Wi-Fi is banned because they uses radio waves which is harmful to humans. All the street lamps can be transferred to Li-Fi lamps to transfer data. As a result it is possible to access internet at any public place. Some of the future applications of Li-Fi are as follows:

- 1) Education systems: Li-Fi is the latest technology that provides fastest speed internet access. So, it can replace Wi-Fi in educational institutions and in companies so that all the people can make use of Li-Fi with the same speed intended in a particular area.
- 2) Medical Applications: In Operation theatres the Wi-Fi is not allow due to radiation concerns. Usage of Wi-Fi at hospitals which interfere with the mobile and pc and it blocks the signals for monitoring equipment's. So it is hazardous to the patient's health. To overcome this and to make Operation theatres safe. The Li-Fi can be used to accessing internet and also to control medical equipment's. Which will be beneficial for robotic surgeries and other automated procedures.
- 3) Cheaper Internet in Aircrafts: The passengers Travelling in aircrafts get access to low speed internet at very high rate. Wi-Fi is not used because it will interfere with the navigational systems of the pilots. In aircrafts Li-Fi can easily provide high speed internet through light source such as overhead reading bulb etc. present inside the airplane.
- 4) Underwater applications: Underwater Remotely Operated Vehicles operate from large Cables supply their power and allow them to receive signals from the pilots. But the tether used in Remotely Operated Vehicles is not long to allow them to explore wide areas. If their wires were replaced with light then they would be much free to explore.
- 5) Disaster management: Li-Fi is used as a powerful means of communication in times of disaster like earthquake or hurricanes. The average people may not know the protocols during such disasters. Subway stations and tunnels, common dead zones for emergency communications. For normal periods The Li-Fi bulbs provide cheap high-speed Web access to every street corner.

## **IX.CONCLUSION**

There is a overabundance of possibilities to be gouge upon in this field of technology. If this technology becomes popular in market then every bulb can be used analogous to

a Wi-Fi hotspot to transmit data wirelessly. By virtue of this we can improve a greener, cleaner, safer and a splendid future.

The concept of Li-Fi is attracting a lot because it offers a genuine and very efficient and alternative to radio based wireless. It has the chance to replace the traditional Wi-Fi because as an increasing population is using wireless internet, the airwaves are becoming increasingly clogged, making it more difficult to get a reliable, high-speed signal. This concept promises to solve issues such as the lack of radio-frequency bandwidth and the disadvantages of Wi-Fi. Li-Fi is the upcoming and on growing technology acting as skilled for various other developing and already invented technologies. Hence the future applications of the Li-Fi can be predicted and extended to various platforms and various walks of human life.

world-is-also-tv-and-provides-gigabit-internetaccess

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### **REFERENCES**

- [1] Jyoti rani, prernachauhan, ritikatripathi, —li-fi (light fidelity)-the future technology in wireless communication, international journal of applied engineering research, ISSN 0973-4562 vol.7 no.11 (2012).
- [2] Richard gilliard, luxim corporation, —the lifi@ lamp high efficiency high brightness light emitting plasma with long life and excellent color quality.
- [3] Richard p. Gilliard, marc devincentis, abdeslamhafidi, daniel o'hare, and gregg hollingsworth, —operation of the li-fi light emitting plasma in resonant cavity.
- [4] Visilink, —visible light communication technology for near-ubiquitous networking white paper, January 2012.
- [5] [Http://articles.economictimes.indiatimes.com/2013-01-](http://articles.economictimes.indiatimes.com/2013-01-)
- [6] [Http://www.extremetech.com/extreme/147339-micro-led-lifi-whereevery-light-source-in-the-](http://www.extremetech.com/extreme/147339-micro-led-lifi-whereevery-light-source-in-the-)