

Lifi- Light Fidelity Technology- A Review

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Abstract-

Li-Fi technology means Light Fidelity technology which was proposed by Harald Haas (a German Physicist). As the name suggests Li-Fi is a data transmission technique which uses illumination for sending the data or light as a medium of communication. It transmits data with the help of an LED bulb having variation in its intensity which has a speed of actually faster than which human eye can follow. It is also known as optical wireless technology or visible light communication. This paper focuses to explore this amazing technology and give a relative study of Li-Fi with other wireless communication technologies like Wi-Fi. Wi-Fi is perfect for transmission of data having a wireless coverage within buildings. But Li-Fi provides better efficiency, higher bandwidth, better security and availability with a very high speed.

Keywords- Li-Fi, Wi-Fi, Photodiode, wireless Communication, Visual Light Communications(VLC)

I. INTRODUCTION

Li-Fi (Light fidelity) is a wireless technology which is based on light as its name indicates not on radio waves. This technology was invented by German physicist Harald Haas, from the University of Edinburgh. He demonstrated it in the year 2012. Li-Fi is an alternative of Wi-Fi that transmit data using the spectrum of visible light. Li-Fi is the wireless communication system in which transmission of data through illumination. Li-Fi technology used LED (light emitting diode) for transmit the data wirelessly. Li-Fi is the fast and cheap optical version of the Wi-Fi. By comparing the speed of Li-Fi with superfast broadband system which is 250times faster. As a replacement of Wi-Fi modems, Li-Fi would use transceiver-fitted LED lamps that can glow a room as well as transmit and receive information.

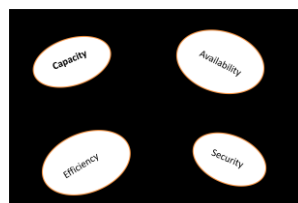


Li-Fi is transmission of data through illumination, i.e. sending data through a LED light bulb that varies in intensity faster than human eye can follow. The transfer of the data can be with the help of all kind of light i.e. Light may be Invisible, Ultraviolet or Visible part of spectrum. The speed of the internet is extremely high.

Li-Fi working technology Li-Fi is based on the use of the visible light b/w blue and red. Li-Fi use the optical spectrum but Wi-Fi uses the radio part of the electromagnetic spectrum. The principle of Li-Fi is simple when the LED turn ON and OFF at high speed which is not visible to human. The amplitude of light is varied. Any LED light set if used along with a microchip inside it can used to detect the changes in the light flickering thus helping in converting light into data in its digital form. When LED on it transmits the digital signal 1 and if LED is off transmit a digital signal 0. A controller is also connected at the back side of these LED bulbs to code the data to these LED. The amplitude of light is varied. Any LED light set if used along with a microchip inside it can used to detect the changes in the light flickering thus helping in converting light into data in its digital form.



Issues With Radio Waves



Capacity:

Current system makes use of radio wave so day by day number of mobile connection increase so the availability of the spectrum getting congested. It has less bandwidth and become expensive.

Efficiency: Million of work station consume huge amount of energy for transmitting radio waves. Almost 1.4 million cellular radio base stations. Efficiency of each base station is just 5%. Most of the energy is not used for transmission but rather used for cooling the base station.

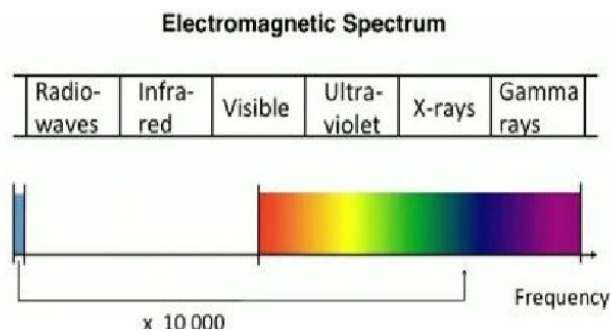
Availability:

There is so many issues with the availability of radio waves. Radio waves unavailable in air craft only available in base station. It is also not suitable to use cell phone at the petrol pumps.

Security:

Radio waves can pass through the walls so they are less secure. Anyone with bad intention can miss use it.

Alternative Of Radio Waves



IR waves are harmful for our eyes hence used at very low power. UV rays are very harmful for our skin and cannot be used for long duration. Gamma rays are radioactive and are dangerous. X rays have similar health issues. All waves have some disadvantages so we are left only with visible light spectrum.

Overcoming the Four Issues with Radio Wave in Li-Fi :

Capacity:

Light is a voluntarily accessible form of energy and so it can cover most of the portion of the EM spectrum. Spectrum of visible light is 10000 times more than the spectrum of radio wave.

II. EFFICIENCY

The data transmission through light can reach up to gigabits per second. The data spread for a unit energy use is high in the case of light waves. Here in Li-Fi data bits can be transmitted parallelly thus increasing the efficiency.

Availability:

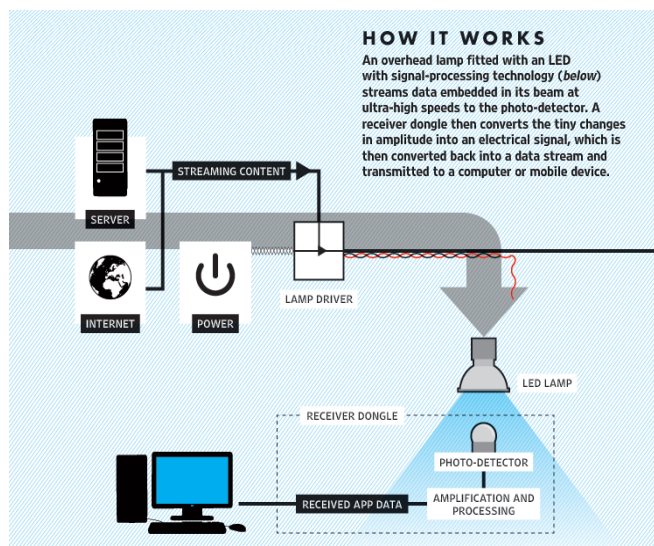
Light is available in every part of the world so this makes it easy for every person in airplanes to work on the internet. There are an expected 14 billion light sources on earth and each can be easily transformed into a LI FI hotspot.

Security:

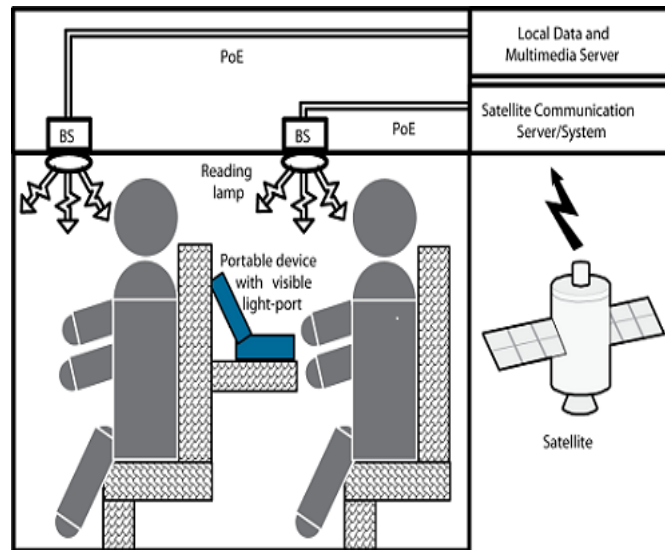
Not like radio waves light waves cannot go through solid (wall) objects thus providing abundance of network privacy. No other person can split a network unless the holder has allowed them to use it.

How Does Li-Fi Work:

The main part of this technology is a new creation high intensity Led's. These LED's varies in intensity (that is gets on and off) so fast that a human eye cannot detect it. If LED is on, then we transmit a digital signal one and if the LED is off, then we transmit signal zero. A controller is also connected at the backside of these LED bulbs to code data to these LEDs.



It is possible to code data in the light by varying the rate at which LED's glimmer on and off to give different strings of 1s and 0s. Modulation is so fast that human eye doesn't observe. Thus every light source will work as a hub for data transmission.



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. A 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.

Advantages Of Li-Fi over Wi-Fi

- It is possible to get more than 10Gbps, hypothetically allow a high-definition motion picture to be downloaded in 30sec.
- Mostly motorized by LEDs so it is cost well-organized.
- Communication of data is fast and easy.
- Li-Fi has a main advantage over Wi-Fi is that its bandwidth is 10,000 more than the Wi-Fi.

Application of Li-Fi

- We can use Li-Fi in hospitals and aircraft also.
- Li-Fi is cheaper than Wi-Fi.
- Visible light spectrum is a free spectrum band.
- No license is needed for the Li-Fi
- Thousands and millions of street lamps can be transferred to Li-Fi lamps to transfer data.
- It can be used for modern medical instruments.
- It can also used in chemical and petroleum plants

III. CONCLUSION

The concept of Li-Fi is now attract a great deal of attention, not least because it may offer a real and efficient another to radio-based wireless. As the increasing number of people and their devices access wireless internet, the air waves are becoming gradually more crammed, making it more and more difficult to get a consistent, high-speed signal. So Li-Fi has a brilliant future. Even if this wonderful technology be used practically, then may be in future each and every bulb can be used something like a Wi-Fi hotspot to brighter future[7].

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