



Comparison between Li-Fi and Wi-Fi

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Abstract-Li-Fi is the new technology to provide wireless internet connections. Li-Fi stands for Light-Fidelity. Li-Fi technology was coined by German physicist Harald Haas. Li-Fi uses LED i.e. Light Emitting Diode for the transmission of data. Li-Fi is useful in many areas such as hospitals, aircraft cabins and the nuclear power plant. Li-Fi technology provides better capacity, efficiency and availability than existing technology i.e. Wi-Fi. This paper focuses on analyze the performance of Li-Fi technology with Wi-Fi technology.

Keywords-Li-Fi, LED light bulb, Wi-Fi, wireless communication, visible light communication (VLC), Line-of-sight (LOS)

I.INTRODUCTION

Now a days, transmission of data from one place to another is day-to-day activity. Wi-Fi is current and most popular wireless networking technology. Wi-Fi stands for Wireless-Fidelity. Wi-Fi technology uses radio waves for transmission of data through wireless internet connections. The speed of Wi-Fi technology is 150mbps. Wi-Fi provides benefit that global accessibility means people can access internet connection at anywhere and anytime. Another benefit is ease of communication that is people can easily communicate with each other and share data i.e. audio, video, images etc. through Wi-Fi technology. There are some limitations in Wi-Fi.

A solution to these problems is by the use of Li-Fi. Li-Fi stands for Light-Fidelity. Li-Fi technology uses visible lights. Li-Fi includes unidirectional and bidirectional data transfer using line-of-sight. Li-Fi technology will be transmitted data through LED light in a room with smartphones, tablets and laptops. Li-Fi was first developed by German physicist-Harald Haas during the TED talk on VLC. He explained "data through illumination" by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. Li-Fi is transmission of data by taking the fiber out of fiber optics. The speed of Li-Fi technology is 1gbps. Li-Fi is fast and cheap wireless communication system. Li-Fi uses visible light for data transfer. Technology is based on VLC stands for Visible Light Communication. VLC is a communication medium that uses visible light between 400 to 800 THZ.

1.1 Advantages of Li-Fi-

1.1.1 Efficiency: Li-Fi based on visible light technology. It consume less energy and efficient related to cost, because for lighting purposes offices, homes have LED light bulbs and that source of light can be used for transmission of data. Data transmission using Li-Fi is very cheap. Li-Fi is very efficient.

1.1.2 Availability: Li-Fi need LED light bulbs. In worldwide, light sources are available everywhere in malls, offices, shoppes and homes meaning that there is not issue of availability. They just need to replace from light to LED light for better transmission.

1.1.3 Capacity: Lights has 10,000 times wider bandwidth than radio waves. Li-Fi got better capacity because light sources are already installed.

1.2 Applications of Li-Fi-

1.2.1 Medical applications: Operations Theaters do not allow Wi-Fi technology due to the radiations. Wi-Fi signals may be hazardous to patient's health so hospitals must block the signals of Wi-Fi.

1.2.2 Educational System: Li-Fi is latest technology can provide fastest speed internet access. It can replace Wi-Fi at educational institutions and at companies. So people make the use of Li-Fi with same speed in particular area.

1.2.3 Traffic Management: LED lights of cars can help in managing the traffic in better way. When other cars are too close then LED lights of car can alert drivers.

1.2.4 Replacement of other technologies: The places where Bluetooth, infrared, Wi-Fi, etc. are Banned there Li-Fi technology can be easily used.

1.2.5 Smart Lighting: Private and public lighting including street lamps can be used to provide Li-Fi hotspots and sensor infrastructure can be used to monitor and control lighting and data.

1.2.6 Mobile Connectivity: Short range links give very high data rates and also provides security. Laptops, smart phones, tablets and other mobile devices can interconnect directly using Li-Fi.

1.2.7 Hospital & Healthcare: Li-Fi emits no electromagnetic interference and so does not interfere with medical instruments, nor is it interfered with by MRI scanners.

1.2.8 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.

1.3 Working of Li-Fi:

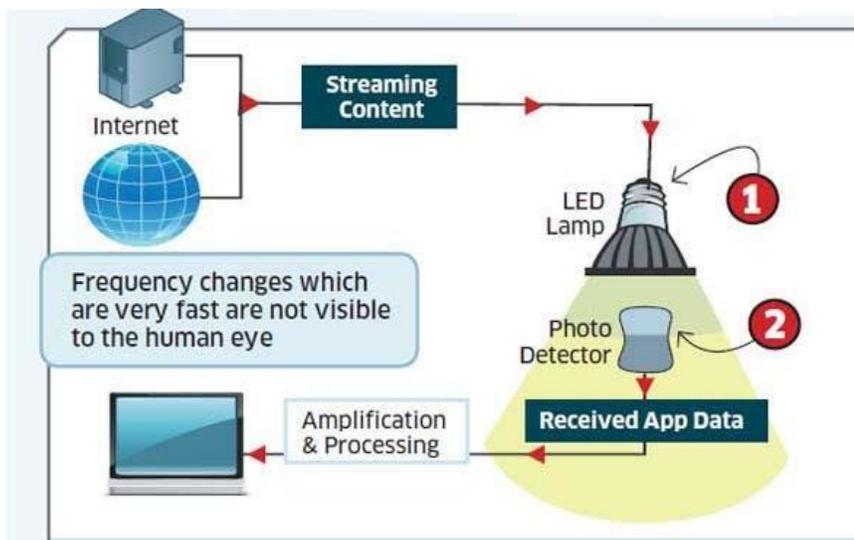


Fig-Working of Li-Fi [1]

The working of Li-Fi is very simple. A streaming content must have proper integration with server and internet network. If the LED is on, a digital 1 is transmitted. If the LED is off, a digital 0 is transmitted. If the power button is on of LED light then ceiling based LED lighting encodes data message from internet as light output to to receiving photo detector. Photo detector will convert the changes light intensity into electric current. This electric current then converted into binary data stream. Binary data stream will send to computers or devices. The high brightness LEDs can be switched on and off very quickly which gives us very nice opportunities for transmitting data through LED light bulb.

Light-emitting diodes can be switched on and off faster than the human eye can detect, causing the light source to appear to be on continuously, even though it is in fact 'flickering'. The on-off activity of the bulb which seems to be invisible enables data transmission using binary codes: switching on an LED is a logical '1', switching it off is a logical '0'. By varying the rate at which the LEDs flicker on and off, information can be encoded in the light to different combinations of 1s and 0s.

II. Comparison between Li-Fi Technology and Wi-Fi technology

| LI-FI | WI-FI |
|---|---|
| Li-Fi transmits data using light with the help of LED bulbs. | Wi-Fi transmits data using radio waves with the help of Wi-Fi router. |
| Do not have any interference issues similar to radio frequency waves. | Will have interference issues from nearby access points (routers). |
| Used in airlines, undersea explorations, operation theaters in the hospitals, office and home premises for data transfer and internet browsing. | Used for internet browsing with the help of Wi-Fi kiosks or Wi-Fi hotspots. |
| Interference is less, can pass through salty sea water, works in dense region. | Interference is more, cannot pass through sea water, works in less dense region. |
| In Li-Fi, light is blocked by the walls and hence will provide more secure data transfer. | In Wi-Fi, RF signal cannot be blocked by the walls and hence need to employ techniques to achieve secure data transfer. |
| Data transfer speed is about 1 Gbps. | Data transfer speed is about 150Mbps. |
| 10 thousand times frequency spectrum of the radio. | 2.4GHz, 4.9GHz and 5GHz |
| It Works in high dense environment. | It Works in less dense environment due to interference related issues. |
| Coverage distance is about 10 meters. | Coverage distance is about 10 meters. |
| System components are Lamp driver, LED bulb (lamp) and photo detector will make up complete Li-Fi system. | Requires routers to be installed, subscriber devices (laptops, PDAs, desktops) are referred as stations. |

III. CONCLUSION

These are the basic difference between Li-Fi and Wi-Fi and using these wireless computer networking technologies, you can easily select the network that suitable you the best and enjoy high-speed internet facility. The concept of Li-Fi is attracting a lot of eye-balls because it offers a genuine and very efficient alternative to radio based wireless. Li-Fi is the upcoming and on growing technology will be competent for various other developing and existing technologies. The concept of Li-Fi is currently attracting a great deal of interest and very efficient alternative to radio-based wireless. As a growing number of people and their many devices access wireless Internet.

IV. REFERENCES

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