

A Review Paper on Li-Fi Technology

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Abstract— Now days the whole world is using internet to accomplish their task through wired or wireless network. When the number of users are increase using wireless network, the speed of network get decreases. Though Wi-Fi gives us speed up to 150mbps as per IEEE 802.11, which is not sufficient to welcomes number of desired users. To remedy this limitation of Wi-Fi, the new concept is introduced, Li-Fi technology. Li-Fi stands for the Light Fidelity. Li-Fi stands for Light-Fidelity. Li-Fi technology, suggested by the German physicist—Harald Haas, provides transmission of data through lighting by sending data from an LED light bulb that varies in intensity faster than the human eye can track. This paper focuses on developing a Li-Fi based system and check out its performance with respect to existing technology. Li-Fi is the one which provides better bandwidth, efficiency, better availability and security more than Wi-Fi and has already achieved blisteringly high speed in the lab.

Key words: Li-Fi Technology, LED, Wi-Fi

I. INTRODUCTION

Li-Fi having a various range of frequencies and wavelengths, from the infrared through visible and down to the ultraviolet spectrum. Moving data from one place to another is one of the most important activities. The current wireless networks that link us to the internet are very slow when multiple devices are connected. As the numbers of devices, usage of the internet enlarge, the fixed bandwidth available makes it more and more difficult to take advantage of high data transfer rates. But, radio waves are just a small part of the bandwidth available for data transfer. Problem can be solved by using Li-Fi. Li-Fi is transmission of data by taking the fiber out of fiber optics by sending data through an LED bulb which varies in intensity faster than the human eye can follow. Li-Fi is the term some have used to label the fast wireless communication system, which is the optical version of Wi-Fi. Li-Fi uses visible light instead of radio waves having bandwidth in GHz for data transfer. The idea of Li-Fi was introduced by a German physicist, Harald Hass. The word Li-Fi was first used by Haas in his TED Global talk on the topic of Visible Light Communication. The basic idea behind Li-Fi technology is that the data can be transmitted through LED light whose intensity varies faster than that of human eye. As the transmission of the data takes place through the light emitting diodes (LED's) the amount is of it is too small. It is called as the optimized version of WI-FI .HARALD HASS, who is considered as the father of the Li-fi, says that the heart of this technology lies in the intensity and the potential of the light emitting diodes. The main reason come out which lead the modern man through this invention is that the confinement of Wi-Fi is because of its small distance. As there are more and more devices coming up day-by-day the signals are being obstruct up due to heavy traffic, there arised a need for an error free transmission technology. And the answer to this problem is Li-fi technology. It can works even under water which causes a great benefit to the military operations. It provides much larger frequency band up to (300 THz) compared to that available in RF communications (300GHz).

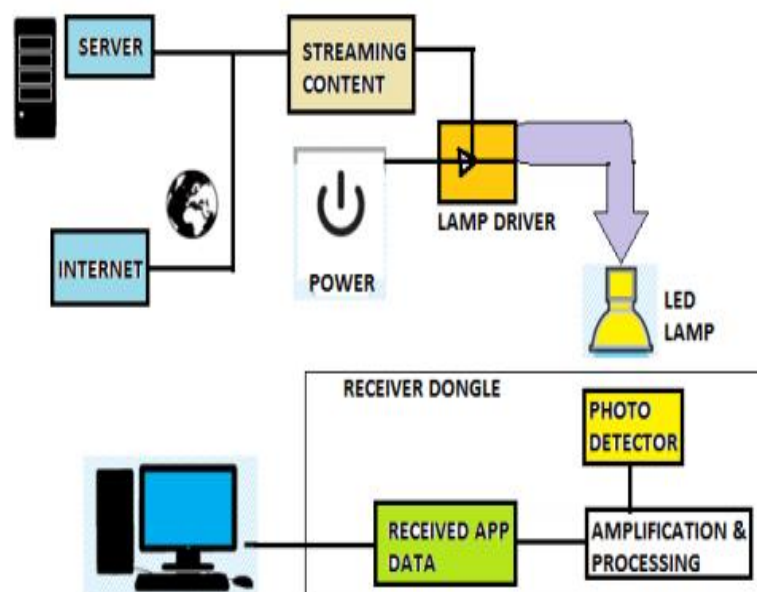


Fig. 1: Block Diagram

II. WORKING OF LI-FI

- Li-Fi is implemented using white LED light bulbs at downlink transmitter.
- By fast variations of the current, optical output can be built to vary at extremely high speeds.
- An overhead lamp fitted with an LED signal processing technology streams data installed in its beam at ultra-high speeds to the photodiodes.
- A receiver dongle then converts the teeny changes in amplitude into an electrical signal, which is then converted back into a data stream & transfer to a computer or mobile device.

The working of Li-Fi is very easy. There is a light emitter on one end, for example, an LED, and a photo detector on the other. The photo detector takes a binary one when the LED is on; and a binary zero if the LED is off. To form a message, flash the LED many times or use an array of LEDs may be a few different colors, to obtain data rates in the range of megabits per second. The data is encoded in the light by varying the fluctuating rate at which the LEDs flicker on and off to generate several strings of 1s and 0s. The LED intensity is modulated so quickly that human eye cannot notice, so the light of the LED become visible constant to humans.

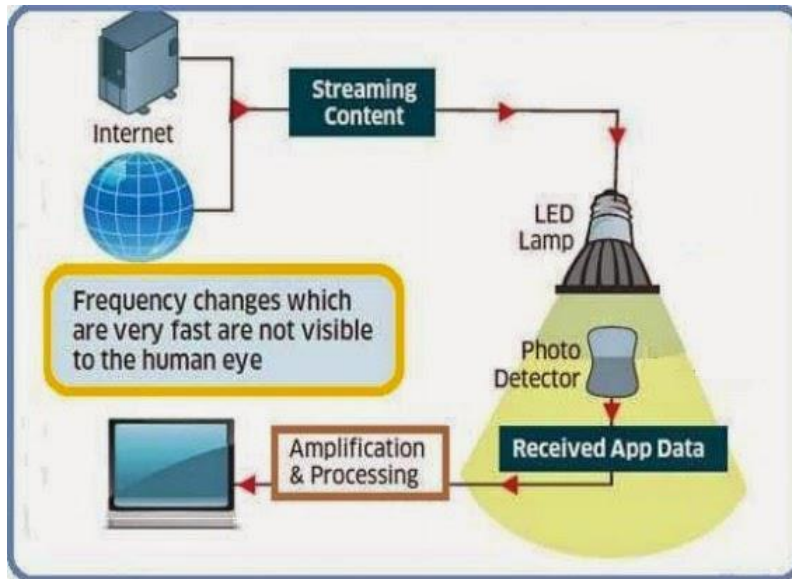


Fig. 2: Block diagram of Li-Fi

III. COMPARING LI-FI WITH WI-FI:

Parameters	Li-Fi	Wi-Fi
Speed	High	High
Range	Low	Medium
Data Density	High	Low
Reliability	Medium	Medium
Security	High	Medium
Power Available	High	Low
Transmit/Receive	High	Medium
Ecological Impact	Low	Medium
D to D connectivity	High	High
Obstacle Interference	High	Low
Bill of materials	High	Medium
Market Maturity	Low	High

IV. LIMITATIONS

- 1) Light can't pass through object
- 2) Interferences from external light sources: sun light, normal bulbs, and impenetrable materials in the path of transmission will cause interruption in communication
- 3) High installation cost of the VLC system
- 4) A major challenge facing li-fi is how the data at receiving device will transmit back to transmitter.

V. APPLICATION

There is a wide necessity for data transfer and by the end of the day every work involves the use of technologies. Li-Fi is the one which can have its applications overtakes in the areas where the Wi-Fi technology failed its presence like in disaster

management, traffic signals and various other areas where Li-Fi proved its perfection of the undersea working capability. At present its applications act beyond imagination but still if to think about few then they are. It can be used in the areas where it is difficult to secular the optical fiber like hospitals. In traffic signals Li-Fi can be used which will communicate with the LED lights of the cars and number of accident can be decreased. Thousand and millions of street light can be transferred to Li-Fi light to transfer data. In aircraft also the Li-Fi can be used for data transmission. It can be used in chemical plants or petroleum where other transmission or frequencies could be hazardous.

VI. CONCLUSION

There are a plethora of possibilities to be grove upon in this field of technology. If it becomes justifiably marketed then every light bulb can be used analogous to a Wi-Fi hotspot to send data wirelessly. By virtue of this we can improve it in following parameters like in cleanness, safety and greenery. The theme of Li-Fi is to attract customers because it offers a great valuable alternate to radio based wireless. It has a good chance to replace the customary Wi-Fi because as an ever growing population is using wireless internet, the airwaves are becoming clogged, making it more difficult to get a desired, high-speed signal. This concept promises to solve issues like shortage of radio-frequency bandwidth and comes with the disadvantages of Wi-Fi. Li-Fi is the emerging and growing technology acting as threat for various other developing and already invented technologies. Thus the future applications of the Li-Fi can be guessed and drawn-out to different platforms and various walks of human life.

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