

A Review Paper on Next Level Communication (Li-Fi)

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Abstract

Now day's in this modern era the technology is updated regularly. We are using internet for communication purpose, and we are using mediums like wired and wireless connections. Day by day users are also increases on the internet which results decrement in the speed of data transmitting. To resolve these issues daily researches are executes from which different technologies are developed. Li-Fi is one of them. It is a wireless technology having 100 times faster speeds then Wi-Fi. This paper recounts the significance of the Li-Fi technology and edges of this automation. Li-Fi, a light fidelity technology that transfigure data in the form of visible light using LED source which introduce a new data transfer technique based on visible light communication and having PAN IEEE 802.15.7 standards. This paper delineates the actual setup of Li-Fi technology in our homes and offices. Li-Fi take the bandwidth to the next level having 300THz over the Wi-Fi which use radio waves just having 300GHz. Li-Fi invites a one more layer of a security and gives an edge whereas it expensive price also give a drawback. The upcoming technology Li-Fi will construct a revolutionary moment in future in data transmitting field. This paper appreciate how becomes feasible to use a light source as transmitter of data.

Keywords: - VLC, LED, Li-Fi, Wi-Fi, OWC, LAN, RF, GPS and IR

Introduction

Decade back when we use internet we always look for LAN(Local Area Network) cables which means we always prefer a wired medium. The main reason behind that is at that time wireless medium is exist but not much developed and transmitting speeds are also slow as compare to wired connections. But now in present days' wireless takeover wired connections because of its high speed, wide range, less complexity and don't need any physical component to connect like wire, switch. As we know that technology is growing daily so it also invites a new upcoming technology "Li-Fi". A VLC(Visible Light Communication) based technology Li-Fi was firstly introduce by Professor Harald Haas in 2011 during TED Global talk in Edinburgh. Li-Fi stands for light fidelity which use LED(Light Emitting Diode) for transmit the data wirelessly. The data in the form of binary numbers 0 and 1 is transmit through light by it flickering mechanism. Here the LED bulb is dim considered as 0 and a glowing LED bulb is considered as 1. Both 0 and 1 is received by photo receiver which is shown in Figure1.



Figure 1. [12]

The main idea was that if we give a constant current to a LED bulb it will give a constant output. Flickering of light is not visible by naked eyes because it will happen in millions of time in a second. So this will give us a proper data transmission environment without compromise any actual working of a led bulb.

Li-Fi is a kind of OWC (Optical Wireless Communication) and can be used as a complement to RF communication (Wi-Fi or Cellular network), or a replacement in contexts of data broadcasting. That is currently attracting a great deal of interest as it offers an opportunity to its users to enjoy high data transfer rate at low cost, that is required as a growing number of people and their recent devices access wireless internet, the waves in the air are becoming increasingly clogged making it more and more difficult to get the signals that are reliable and high in speed [1].

Applications

Education and Entertainment: The speed of Internet on Li-Fi would be much faster than that of the Wi-Fi moreover the capacity of light spectrum is much larger than that of radio waves so this advantage of speed and capacity can reformulate and revolutionize the Internet usage in education and entertainment domain.

Ease of accessibility: The various light bulbs that speck the streets and lanes all over the world have probable of becoming access point for high speed Internet access if Li-Fi technology is toted in its true sense not only street lamps but light sources in homes, offices and other public places.

Airways: The communications of the airways are based on the radio waves, so that travel during the airplane problem occurs in communication media. To overcome this problem Li-Fi tech is used. In aircraft LED lights already deployed, by using this it gives light as well as internet. And no any issue to the aero plan [2]

Intelligent Transport System: LED equipped headlight and backlights, where the cars can talk to each other and react faster when they are Li-Fi enabled. Traffic lights and street lights can talk to each other and also to the cars which can indeed reduce the number of accidents [3]

Smart Museums: Another area where communications and radiation levels are intensely monitored, museums have strict rules about the environments where they store their treasures Li-Fi could enable a museum to deliver much more information on prices in their collection than those tiny cards they paste to the walls could ever dream of you could learn about the artist's history, listen to an audio tour, peruse recent auctions of their work, and may be even stream [4]

Underwater: Radio wave cannot propagate underwater due to its property but light can we could envisage communication system such as divers can talk to each other with their lights.

Remote under sea operated vehicles works with large cable that supply their power and send the signal information from their pilots above the sea. When the cable is not long enough to explore an area there is nothing that we can do but with Li-Fi we could be cable to replace the cable and only communicate with light [5]

Indoor Communication: The Li-Fi system allows an indoor navigation where the LED lights sources are used like shopping malls, cinema theatres, government offices, work offices or any indoor locations. [6]

Traffic management: In traffic signals, LED and the Car light LEDs communicate with each other, which can help in managing the traffic in better manner and the accidents number of decreased which is shown in Figure 2. [7]

Medical application: In the operation theatres do not allow radio waves. It hazards to the patient's health. To overcome this Li-Fi technology is used. [8].

Various Other Areas: - Can be used effectively in the places where it is difficult to lay the optical fibre cable. In operation theatres Li-Fi can be used for modern medical instruments. In traffic signals Li-Fi can be used to communicate with the LED lights of the cars. All of the street lamps can be transferred to Li-Fi lamps to transfer data. In aircraft Li-Fi can be used for data transmission. It can be used in petroleum or chemical as well as in nuclear plants where other transmission or frequencies could be hazardous [9].

Learning: - Lecture Halls Can Be Fun. Okay, well maybe not fun, but better. A few teachers tell me to download lecture notes from their blog in my time. Half the time I wished I already had the notes with me so that I could follow along as the lecture progressed. Imagine how interactive the classroom could be with real-time interconnectivity between 500 devices [10].

GPS usage: - Satellite navigation has been one of the most important technological advances of the last 50 years. No matter how good the systems get, they still don't work where we spend the majority of our time: the great indoors. Tools have been devised that cleverly use Wi-Fi triangulation and "hybrid" GPS (say, GPS coordinates combined with sensor data from a compass, pedometer, and accelerometer), but these are inaccurate and generally unreliable. A company called Byte Light is trying to change this situation with a system that uses LED lighting to provide devices with accurate location data. [11].



Figure 2. [11]

Advantages

- The speed of Li-Fi is faster than all wireless networks.
- Light do not produce any radiation which is harmful for us.
- VLC could be used safely in aircraft without affecting airlines signals.
- Light can be used in sea and hence undersea explorations are good to go now with much ease.
- On highways for traffic control applications like where Cars can have LED based headlights, LED based backlights, and they can communicate with each other and prevent accidents.
- Cost of electricity is low.

- In security purpose the light waves do not penetrate through the walls, so there is no question for misuse it. It is Highly secure. [12]
- Li-Fi does not required any license, it has free band.

Working

Li fi is very faster technology than Wi-Fi. The technique is faster means the speed is 10 Gbps, downloading the full high definition film in just few seconds.

Li-Fi can harmonious technology than existing communications technologies. The main component of the Li-Fi technology: LED: At the sending side controller that code the data into LEDs, all the one has to do is to vary the rate at which LED is flicker depending on the data want to encode. The rate of flickering is very high so that cannot distinguish light for the human eye.

In Figure 3 a data comes from server or Internet which is transmitted through streaming content which sends data to lamp driver. Lamp driver converts data and send it to lamp now this data is received by a dongle which consist of photo detector and IR capture chip then it amplifies and process the data to our device where we connect dongle or a device which receives data from lamp.

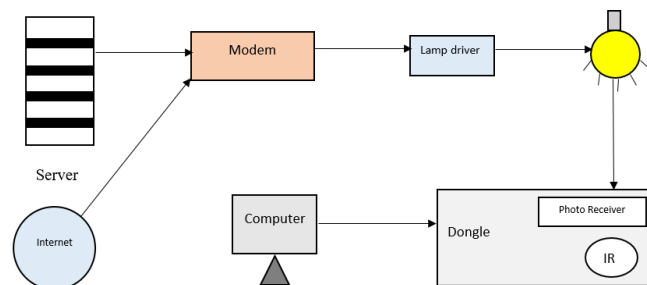


Figure 3.

Conclusion

The plan of Li-Fi technology currently entice us a great deal of the attentiveness because its latest and very well organized apparent to wireless technology. As LEDs become a more common source for room lighting, but there is new way for linking mobile devices to the Internet, which is gives the large bandwidth and high speed than Wi-Fi. Li-Fi has the many advantages such as in transports, cabins, education, companies and power plants and also in the low cost. The Li-Fi cannot pass through the wall and other opaque materials which radio waves can do. But it is highly secured than another.

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