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Study & Analysis of Role of Li-fi in Future

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Abstract

*In this hi-tech world, privacy is most important issue. Has anyone ever imagined why this problem arises? In the field of correspondence media or portable correspondence, web association is a spine of data and correspondence innovation which gives numerous administrations to client to these applications we need quick and headway of Internet integration innovation and vast range of channels[1]. Internet access speed or whether it is about downloading files, internet speed is big issue. Why not take a step further to resolve this problem? The answer to our problems is '**li-fi**'. Have you ever wondered a city where internet access is wireless and without any interruption? Like other queries science has an answer to these questions also which is LIFI. LIFI is the new future. From sharing data to accessing it, can be done for laptops, smart phones, and tablets through transmitting light from LED bulb installed within the room. And for the security, if you can't see the light, you can't access the data[2].*

Keywords*: Light-Fidelity, unintercepted data, LED access*

1. Introduction

Whether it is the point about hiding personal data of a company or whether using internet underwater or accessing data without any interference, wifi fails in all departments. Li-fi not only resolves these problems but also it's usage is efficient and cheap. Almost everyone uses Wi-Fi so often. But this wireless technology has a drawback that they use radio waves to communicate. The problem associated with these radio waves is, they transmit data slowly and the signal is often blocked by equipment as simple as the microwave or refrigerator in our kitchen [1]. Accessing data from one place to another is one of the most basic activity of our lives nowadays. So with these type of complex waves sometimes transfer of data is difficult. Nowadays, the network which we use, face the problems of access speed when connected to multiple devices. It creates an usual problem when connected to multiple users, the fixed bandwidth which is available for the particular user makes it more difficult to enjoy high data transfer rates and connect to a secure network. As the multiple users increases it creates some gaps between the connections through which it is easier for the hackers to get through the connections. '***Li-Fi' or ' Light-Fidelity '*** which uses special LED bulbs for accessing or transferring of data[3].

Li-Fi is basically transmission of data, through illumination of special LED bulbs and using a photodetector to detect the signals .Whose intensity is much faster than the human eye can follow. Li-Fi is the solution as it is cheap and much more effective than Wifi. Li-Fi uses visible light spectrum instead of radio waves for transferring of data. Harald Haas

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from University of Edinburgh gave a splendid thought in his TED, Global chat on LIFI. He clarified "that if the LED is "on" then the advanced 1 can be transmitted and if the drove is "off" at that point the advanced 0 can be transmitted[1]. In this strategy for all information transmission we need is LED's and controller to code or decipher information into LED's. To improve in information transmission or a parallel information transmission by a LED's cluster red, green and blue LED's

How the Idea Came?

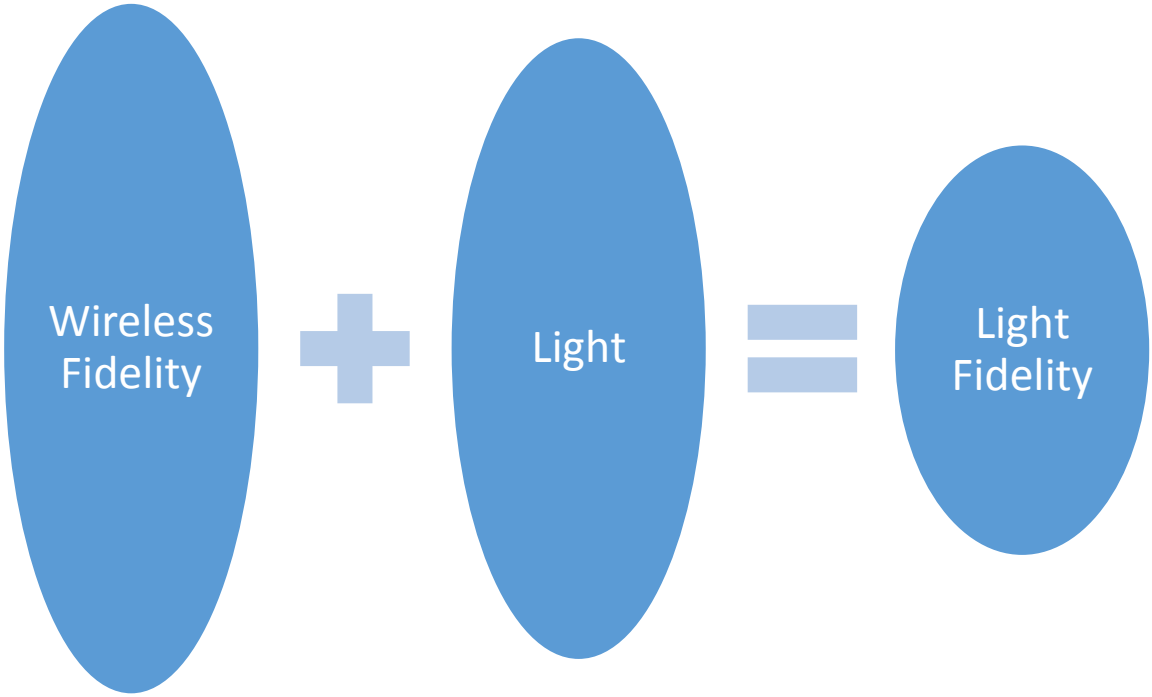

Figure 1. Basic Design of Lifi

When we went through the project we found few interesting things about it:

- First, of all the unintercepted data access.
- Second, the much faster speed than wi-fi.
- Third, the most important feature is that all the data is confined in one room only.

2. The Problems

Although the usage of wi-fi is vast, but still it has many flaws within it. From privacy to speed, from interference to efficiency it has created problems to the users. Wi-fi routers or modems send harmful ultraviolet radiations to penetrate through the walls.

3. The Solutions

Li-fi is wireless technology, which uses special LED bulbs having spectrum in visible light region. It not only carries much more information but is easy to access and is ecofriendly too.

4. Details

The idea of Li-Fi was introduced by **'Harald Hass'**, who is working as a German physicist and he proposed this technology as data illumination. According to him, Li-fi can produce data rates more than 10 megabits per second which is much faster than our simple broadband connection which we use in our daily purposes . He says he can see the future where wired connection will be a past[1]. Li-Fi can play a major role as in many fields , as it uses unutilized visible light spectrum to transfer or access data .Li-fi is the future through which data can be accessed in laptops, smart phones etc. with just some LED bulbs and photodetector[2]. Hacking chances would be reduced by it, as this technology cannot penetrate through walls, so data is confined within a specific region. As a result, it can be used in that area where there is more chances of hacking and data loss. Li-Fi is designed for future perspective. However, Li-Fi bulbs are much more efficient and reliable.

5. How it is Better?

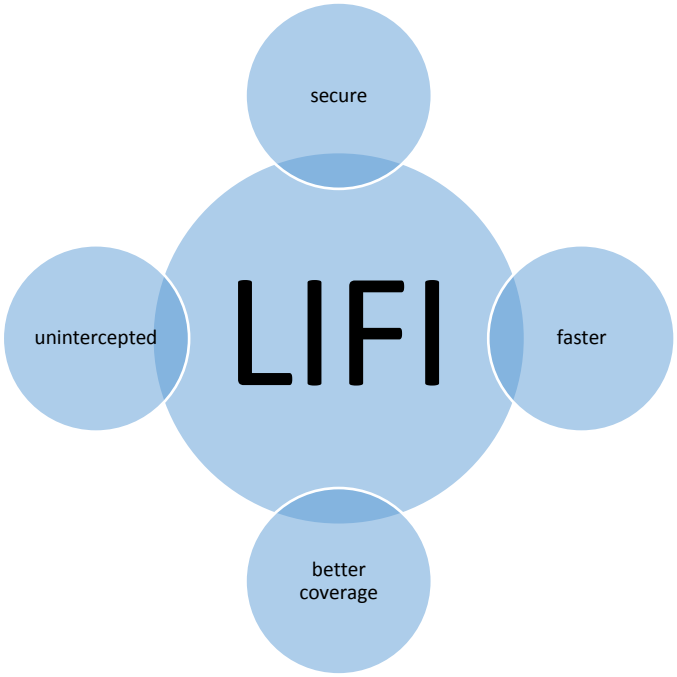

Figure 2. Comparison of Li-fi with Wi-fi

The figure 2 just shows how Li-Fi is better compared to Wi-Fi. From security to accessing data it has shown positive responses in all fields. Li-Fi could lead to the Internet of Things, which is everything electronic which supports LED bulbs being connected to the internet. It can hook up with our home appliances like our electric kettles, our microwave ovens which support LED bulbs. The traffic lights can communicate with your car lights and vice-a-versa. It is estimated that Li-fi market should have a compound annual growth rate of 82% from 2013 to 2018 and to be worth over $6 billion per year by 2018 [3]. Li-Fi has the advantage in the areas such as in aircraft cabins, hospitals and power plants without causing electromagnetic interference. Also in underwater, where there is no possibility of data transmission Lifi can play big role in it as deep sea divers or submarines do have facility for LED torch bulbs there. Both Wi-Fi and Li-Fi transmit data over the electromagnetic spectrum, but whereas Wi-Fi uses radio waves, Li-Fi uses visible light which makes it much cheaper than Wi-Fi [4]. While it may take a certain number of years to bring this revolution to our homes, but its potential is quite impressive. In laboratory testing also it has shown great response in terms of speed and security.

5. Working

The working of Li-Fi technology is quiet simple. On one end there will be a light source or LED bulbs on the end there will be light sensor or photo detector. Photo detector will give output in the binary format like 0 or 1 when it will sense the presence of LED bubs.

Now, the question arises how the data can be transmitted through it? Flashing a LED certain times behaves like a trigger and the photodetector detects it. Using more coloured LED or other patterns will transmit different type of data in a different manner.

6. Challenges

The basic disadvantage is that it needs a light source and a photo detector. Other challenges include, how efficiently the data is transmitted. Besides all the plus points, it needs a good response from the users also. Ignoring this just assume a future efficient enough to transmit, access and transfer data just by a LED bulb. Everyone, whether there is hospital or bus or stations accessing data without any problem. Some researcher are working on FPGA based solution for challenges [5-7].

7. Future Scope

Although Li-fi has been installed in many smart cities but still it is under progress. Although it will take a long time to get through its perfect usage. But still it is a big revolution to the humanity. Internet working all over city with just some LED bulbs and a better technology. Just imagine, people sitting under street lights and operating internet with ease.

References

[1]. S. P. Jones, "Microsoft Research, Cambridge", TED talk, available link www.digitaltrends.com /mobile/light-bulb-li-fi-wireless-internet , **(2011)**.
[2]. J. Sherman, available link newtecharticles.com/new-li-fi-technology-to-access-internet/, **(2013)**.
[3]. P. K. Bhardwaj, url: http://www.mitpublications.org/yellow_images/1411458273 _logo_5.pdf
[4]. A. Khan, "How you can use Li-Fi technology for data transmission", url: www.ismag.com/li-fi-for-data -broadcasting/, **(2014)**
[5]. B. Das, A. Kiyani, V. Kumar, M.F.L. Abdullah, B. Pandey, "Power optimization of Pseudo Noise based optical transmitter using LVCMOS IO standard", Power Generation System and Renewable Energy Technologies (PGSRET), **(2015)**, pp.1-7, 10-11.
[6]. M.F.L Abdullah, B. Das, M. S. N. Shahida, B. Pandey, "Energy-Efficient Pseudo Noise Generator Based Optical Transmitter for Ethernet(IEEE 802.3az)", IEEE/Scopus Int. Conf. on Computer, Communication, and Control Technology (I4CT'15), 21 – 23 April 2015, Kuching, Sarawak, Malaysia.
[7]. B. Das, M.F.L Abdullah, B. Pandey, "Temperature Control of Pseudo Noise Generator Based Optical Transmitter using Airflow and Heat Sink Profile at High Speed Transceiver Logic IO Standard", Int. Conf. on Sensors, Materials and Manufacturing (ICSMM), **(2015)**; Ho-Chi-Minh, Vietnam.

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