ISSN: 2278-4632
Vol-10 Issue-5 No. 10 May 2020

LI-FI – "WIRELESS DATA FROM EVERY NETWORK"

[1]Gaurav Gupta, [2]Amit Kumar Jain, [3]Tarun Mishra,[4]Manisha Kumawat
[1]2016pceecgaurav029@poornima.org, [2]amitjain.2102@gmail.com
[1]B. Tech Scholar, Poornima College of Engineering, Jaipur
[2,3,4]Assistant Professor, Poornima College of Engineering, Jaipur

ABSTRACT:

Science and Technology can be known as a primary weapon of current period. Expanding innovation not grows just new creations yet in addition gives another and simpler life to people. Today we are talking about a such invention which gives a new way to send or receive data from light source called LI-FI technology. It is based on the concept of Visible Light Communication (VLC). It can also be called as complementary technology to radio frequency (RF) technology. Using VLC concept, fluorescent lamps gives 10Kbps data transfer rate while Light Emitting Diode gives up to 10Mbps data transfer rate over short distance. This paper motivates us about how LI-FI is an emerging technology that helps us in future not only with its high speed but also reduce the interference of the RF signal that we are facing in Wi-Fi technology.

KEYWORDS

LI-FI, LED, VLC, Wireless, Radio frequency, data, photophone.

1. INTRODUCTION

Today we are using existing technology called wireless fidelity (WI-FI) which uses RF spectrum for data transferring. This technology cost a lot, provides less data transfer /receive rate. So, to achieve a high data speed and make a technology cost efficient a new technology is introduced called LI-FI. It stands for light fidelity, a new way to transmit and receive data with very high speed. It uses a visible light spectrum of EM spectrum for data transfer which is totally free. This technology is not new, Graham bell who is also known for his telephone invention had demonstrated a photophone before it. Using Sunlight, the photophone transmitted a voice signal up to 200 m range in 1880. At transmitter end sunlight was reflected by a vibrating mirror, which was connected to a microphone. And at receiver side a parabolic mirror is placed with selenium cell which captured the vibrating intensity of the sunlight and converted it into electrical signal and a loudspeaker was attached to it. The fluctuation in vibration intensity is proportional to the current which is generated by a microphone, so this technique helped him to transmit voice signal wirelessly using sunlight.

"Figure 1. LI-FI Technology"

This technology has a different importance in it. A normal light which we are using in our homes, offices, vehicles at any place can gives us a facility to transmit our data to others with a very high-speed rate and a no cost.

2. METHODOLOGY

Discussing system, the rule of LI-FI is exceptionally straightforward. Light Emitting Diode (LED) can turn on and off very fast.

 Copyright © 2020 Authors

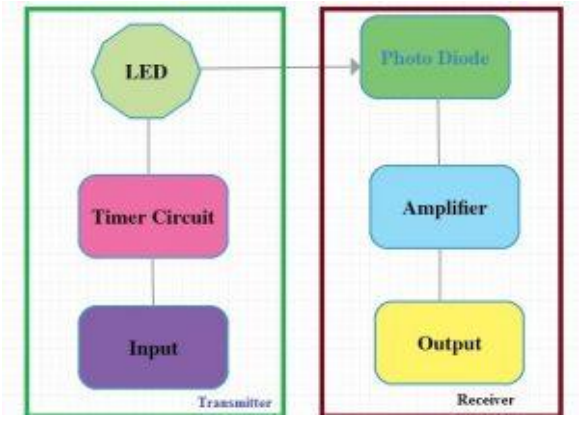
ISSN: 2278-4632
Vol-10 Issue-5 No. 10 May 2020

"Figure 2. Binary Data Transmission"

The operating on-off time is less than 1 micro second which is very fast even our eyes can't see it fluctuating. The imperceptible on-off action empowers a sort of information transmission utilizing double codes. When the LED is off the logical code is "0" and when it is on the logical code is "1".

3. LI-FI SYSTEM BLOCK DIAGRAM

LI-FI framework comprises of two sections specifically transmitter and collector. At the transmitter side the information signal is balanced with a particular timespan utilizing clock circuit and transmit the information utilizing LED bulb. In the form of binary digit i.e. 0 and 1. At receiver side a photodiode is used to receive the led flashes and gives us the output.

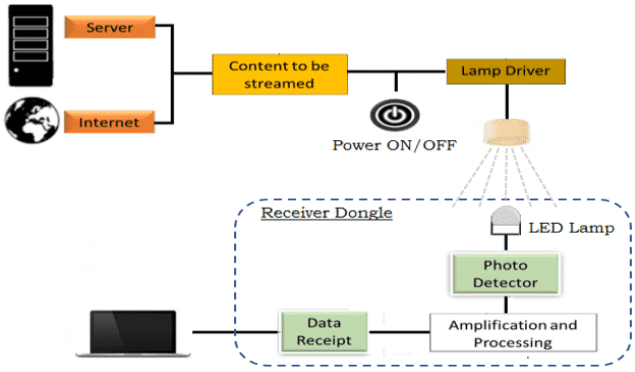


"Figure 3. LI-FI Technology Block Diagram"

4. WORKING

As we have seen that LI-FI innovation depends on the
guideline of Visible Light Communication (VLC). VLC has two fundamental parts for the working motivation behind LI-FI. These are:

a) Photodiode to receive signals
b) Light source coupled with Signal Processing Unit.



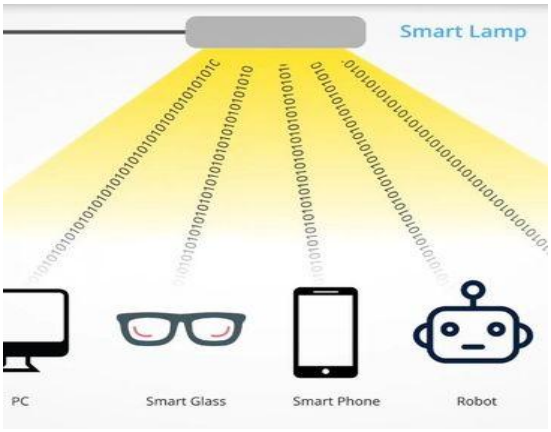
"Figure 4. LI-FI Working"

LED is fitted with signal handling innovation that streams the information implanted in its pillar to fast and afterward send it to the photodiode. A beneficiary dongle at that point changes over the information into electrical sign, which is again changed over go into an information stream and transmitted to a PC or a cell phone.

5. APPLICATIONS

The uses of LI-FI innovation are as per the following:

- Access of internet using existing lamps/bulbs.
- In auto-pilot car to communicate between two cars through their LED based headlights.
- In medical area. To communicate with others doctors across globe in operation theater.
- Appliances controlling in smart home.
- Smart city.
- Smart transport



"Figure 5. LI-FI Applications"

 Copyright © 2020 Authors

ISSN: 2278-4632
Vol-10 Issue-5 No. 10 May 2020

6. SPECIFICATIONS OF LI-FI OVER WI-FI

Table: 1. Specifications of LI-FI over WI-FI

Specification	LI-FI	WI-FI
Spectrum used	Visual Light	Radio Frequency
Cost	Low	High
Security	High	Less
Data transfer speed	Higher up to 100 times than WI-FI	Less
Range	Short than WI-FI	Less than 200 m
Availability	Yet to be available	Widely available

7. FUTURE ASPECTS

This is another rising innovation and furthermore this innovation requires significant significance in information moving. The working is as yet going on this innovation and might be financially accessible in the mid of 2025 after 5G. With more and propelled variant of this venture might be seen further in the propelled world.

8. ADVANTAGES

- Ultra-fast data communication.
- No interference as seen in RF communication.
- Cost effective due to use of VLC portion of EM waves

9. LIMITATIONS

The impediments of LI-FI innovation can be expressed as follows:

- Requires presence of light.
- The data transmission is affected due to opaque objects, obstacles since light cannot pass through it.
- It has much shorter than WI-FI.

10. CONCLUSION

This technology is very efficient, fast and cost effective, more research and development has yet to be done in this field. Due to higher speed rate of data transfer in upcoming days, this technology used as a major weapon.

11. REFERENCES

[1] A. A. Purwita, M. D. Soltani, M. Safari, and H. Haas, "Handover Probability of Hybrid LiFi/RF-based Networks with Randomly-Oriented Devices," in IEEE Veh. Technol. Conf. (VTC Spring), Porto, Portugal, June 2018.

[2] A. M. Khalid, G. Cossu, R. Corsini, P. Choudhury, and E.Ciaramella, "1-Gb/s transmission over a phosphorescent white LED by using rate-adaptive discrete multitone modulation," IEEE Photon. J. 4, 1465–1473 (2012).

[3] C. Chen, D. A. Basnayaka, and H. Haas, "Downlink Performance of Optical Attocell Networks," J. Lightw. Technol., vol. 34, no. 1, pp. 137–156, Jan. 2016.

[4] E. Bialic, L. Maret, and D. Ktenas, "Specific innovative semi-transparent ´solar cell for indoor and outdoor LiFi applications", Applied Optics, vol.54 No. 27, pp. 8062–8069, September 2015.

[5] M. C. Di Piazza, A. Ragusa, M. Luna, and G. Vitale, "A Dynamic Modelof a photovoltaic generator based on experimental data," International Conference on Renewable Energies and Power Quality, vol.1 No.8, pp.1410–1416, April 2010.

[6] T.L Saaty, "What is the analytic hierarchy process?," in: Mitra G.,Greenberg H.J., Lootsma F.A., Rijkaert M.J., Zimmermann H.J. (eds)Mathematical Models for Decision Support. NATO ASI Series(SeriesF: Computer and Systems Sciences), vol. 48. Springer, 1988 Berlin,Heidelberg.

[7] T. Norp, "5G Requirements and key performance indicators," J. of ICT,Vol. 6 1&2, 15–30. River Publishers, May 2018.

[8] D. Kennedy, "Euro-5G – Supporting the European 5G Initiative, D2.6 Final report on programme progress and KPIs," Oct. 2017.

[9] K. Abboud, H. Aboubakr Omar, and W. Zhuang, "Interworking ofDSRC and cellular network technologies for V2X communications: a survey," IEEE Trans. on Vech. Tech, vol. 65, no. 12, Dec. 2016.

[10] J. Cosmas, M. Ran et al., "A 5G radio-light SDN architecture for wireless and mobile network access in buildings," IEEE 5G WorldForum (5GWF), 2018.

[11] J. Cosmas, M. Ran et al., "A scalable and license free 5G internet ofradio-light architecture for services in homes & businesses," The IEEE Int. Sym. on Broadband Multimedia Systems and Broadcasting (BMSB)," June 6-8, Valencia, Spain, 2018.

[12] S. Sudha et al., "Patient monitoring in the hospital management usingLi-Fi," IEEE Tech. Innovations in ICT for Agriculture and Rural Development (TIAR), Chennai, India 15-16 July 2016.

 Copyright © 2020 Authors