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Fundamentals of Li-fi

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Abstract: ***Light fidelity technology have outdated other wireless technologies like wifi and infra-red communication. Li-fi is visible light communication(VLC). The transmission of data in this technology takes place with the help of LED glow whose intensity varies at a very high rate which is merely visible to human eye.[1] In this paper, the author have focused on how Li-fi technology is beneficial as compared to other wireless technology including zig-bee , wifi and Bluetooth. The parameters like cost, mobility, bandwidth, security and speed, advantages and scope of Li-fi technology have been discussed.***
Keywords: LED, WI-FI, LI-FI ,SPEED, BLUETOOTH

I. INTRODUCTION

This Faster communication and data transmission are major factors now a days to consider. Since we have entered in the world of technology, the transmission speed is a great demand which is increasing day by day. A slow internet can make people frustrated as they want their work to be done in seconds. The rise in the internet users make the radio frequency packed , resulting in slow speed [2]. On contrary to this, the demand for wireless network almost double each year [2].Therefore, we need a very fast network. Dr Harald Hass introduced Li-fi system as a solution. The data is transmitted wirelessly with the help of led lights. It is simply a wireless network that transmits data when the led lights are provided with varying current at extremely high speed which is very hard to recognize by a human eye. Visible light spectrum is used by Li-fi which differs it from other technologies like wi-fi that works on radio frequencies.

There is not any strict regulation of using a particular type of light source .However, use of led lights have been prioritized over incandescent lights as they cannot break easily due to the continuous fluctuation unlike incandescent light [3].

II. WORKING PRINCIPLE

An The Li fi working principle is not very complicated. The led is off when “0” is transmitted and led is on when “1” is transmitted, but this all happens in nanoseconds. The working of Li-Fi is divided into two parts i.e transmission and receiving of data. The major components used for the process are Analog to Digital Converter, LEDs, photodiode , Digital to Analog Computer and amplifier. [4]. In the first phase, the transmission of data takes place, the transmitted data is first converted to digital data and is transmitted to LED that is controlled by a signal processor[4]. The data in the form of electric pulses is transmitted in this wireless channel [4]. On the receiver side the data is received by photodiode in the form of electric signal which is then amplified and converted back to analog by Digital to Analog Converter

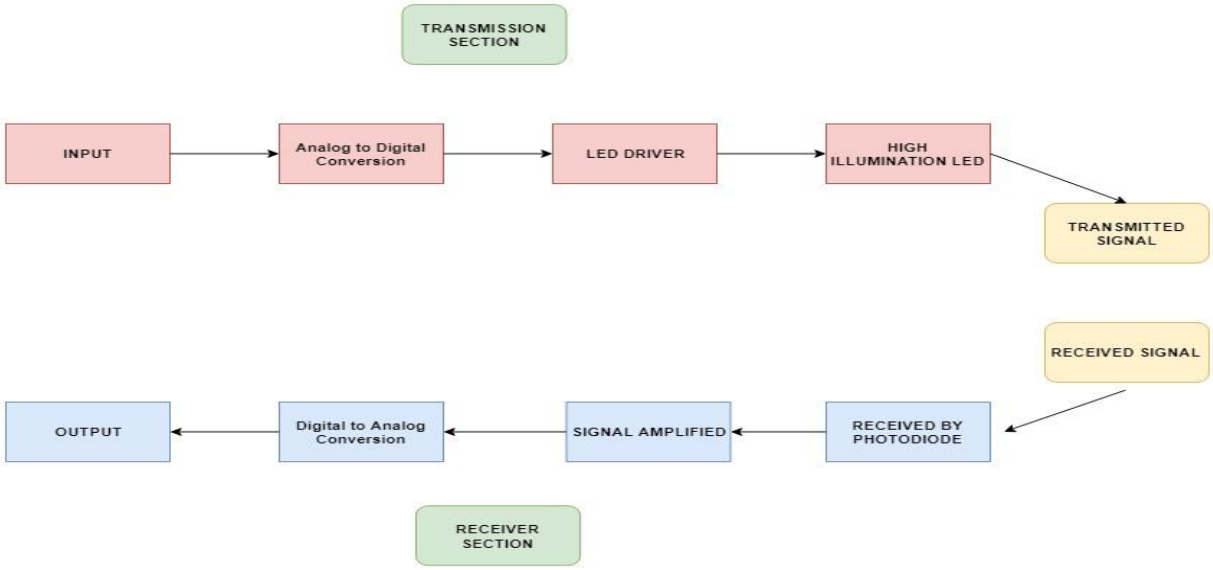


FIGURE 1: WORKING OF A LI-FI SYSTEM

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III. COMPARISON OF LI-FI TECHNOLOGY WITH WI-FI

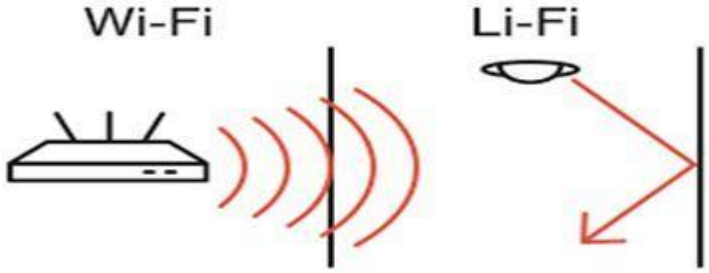


FIGURE 2: COMPARISON OF LI-FI AND WI-FI [8]

Fidelity and Wireless Fidelity both are wireless technologies with some differences .

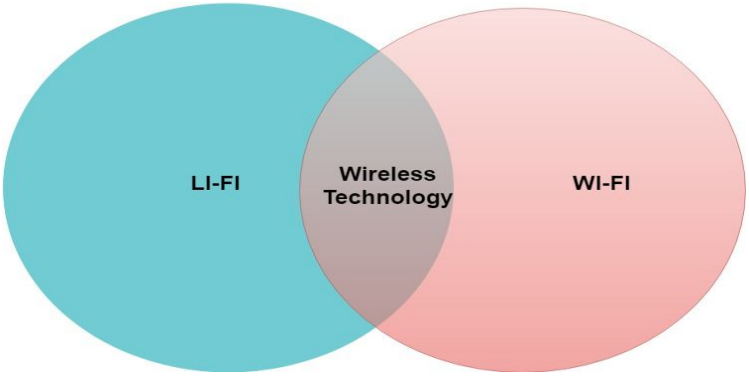


Figure 3: Venn Diagram For Li-Fi And Wi-Fi

1) *Speed:* The Li-Fi is faster than Wi-fi and transfers 1 Gbps whereas Wi-fi offers 150 Mbps [4]. It is because of the major technology used in both cases i.e Visible Light technology and Radio waves. Visible light spectrum is 1000 times greater than 300 GHz of Radio frequency spectrum is far behind.

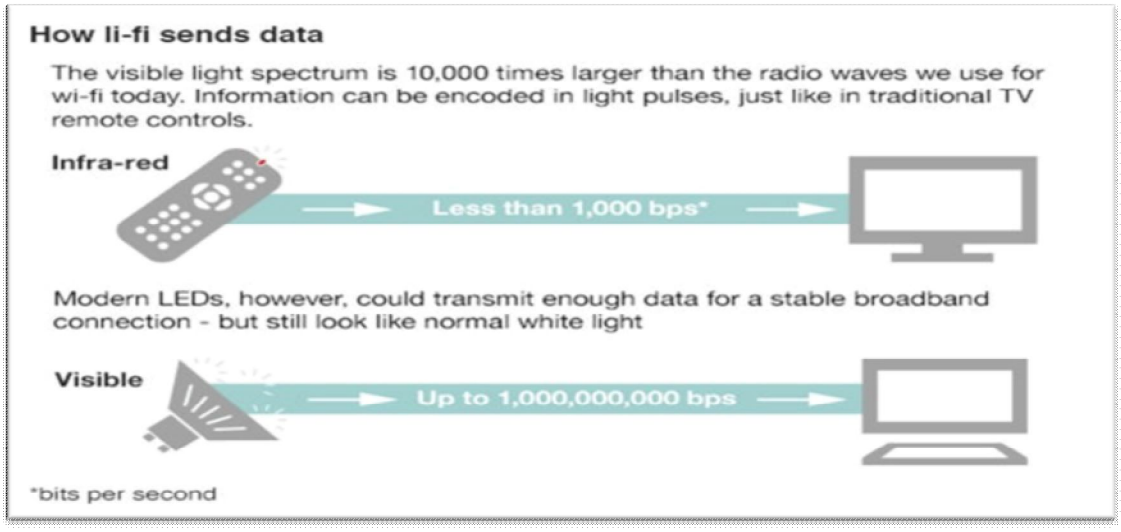


Figure 4: Comparison Of The Speed Of Li-Fi And Wi-Fi [5]

2) *Energy Efficient:* Wi-fi uses two radios for communication which utilizes a lot of energy to recognise the signal from noise as many other devices are also using the same frequency. RF transmittor an baseband chip are used by each device to enable communication. Whereas LED lights are used in Li-Fi, the transmission requires minimal power to permit commication.

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3) *Security:* Wi-Fi has a wider range (almost 32 metres) and it can be acessed throughout different parts of a building whereas Li-fi cant penetrate through walls an ceilings that's why its more secure. But due to this reason separate LEDs are required to be installed in different rooms but the data is more secure and can not be hacked. Therefore Li-Fi technlogy is secure than wifi.
4) *Density:* Li-Fi can work in denser regions like in salty sea water, whereas wi-fi works lesser in denser regions.
5) *Coverage Distance:* Li-fi coverage is upto 10 metres whereas Wi-fi can cover upto 32 metres
6) *Operation:* Li-fi uses light and transmits data with the help of LED whereas Wi-Fi uses radio frequency and data is transmitted through routers
7) *System Components: Lamp driver, LEDs and photo detector are used to make a complete Li-Fi system. Whereas Wi-fi requires routers and subscriber devices.*

TABLE
COMPARISON OF L-FI, BLUETOOTH AND ZIGBEE

FEATURE	LI-FI	BLUETOOTH	ZIG-BEE
IEEE Standard	802.15.7	802.15.1	802.15.4
Range	10M	10m	10-300mm
Data Rate	1-3.5 Gbps	780kbps	250kbps
Bandwidth	100 times of Terahertz	2.4 GHz	868/915 mHz 2.4 GHz
Network Topology	Point to point	Point to Point	Peer to Peer
Technology Used	Light fidelity	ISM band	Rf
Security	High	Low	Medium
Coverage	indoor	Indoor	Indoor

Bluetooth became a consumer technology in the year 2000. It is slower than wi-fi and li-fi technologies.It works best in device to device communications.Bluetooth technology is designed to transmit data over short distances upto 10 metres. Mobile devices particularly use this technology. [6]
Zigbee technology is a simpler technology than bluetooth and wifi. It follows mesh topology scheme and works for the distances upto 300mm.Zigbee supports both configurations i.e master to master and master to client. They are extendable, and can connect routers and nodes to form a WAN(wide area network).

IV. ADVANTAGES AND APPLICATIONS OF LI-FI:

1) *Healthcare/Hospitals:* Li-fi connections are most suitable for the areas where radio frequency signals and rays are considered as harmful for patients. Apart from hospitals, the li-fi can save the people from the daily interaction with harmful waves which are a result of wi-fi and causing serious diseases.
2) *Educational Institutes*: Fast speed and connection can help students to do their work at a better pace.[9]
3) *Airlines:* Can be use in the areas where wi-fi is strictly not allowed like in airlines. The aircraft already contains lights and so a li-fi connection can be easily developed without any impact on tha radar signals. [9]
4) *Availabilty:* Billions of light worldwide can be use as a source of li-fi. The street lights can be used as a li-fi hotspot in future. This will help in overcoming the wi-fi and its hazards.
5) *Security:* As the lights can not penetrate through the walls, therefore its much safer and trustable.
6) *Safety:* It will not penetrate in the human,s body unlike radio waves which penetrates.
7) *Efficient:* It helps user in downloading movies, songs etc at a very high speed.

V. LIMITATIONS OF LI-FI

The li-fi signals can not pass through light therefore it needs a proper set up . It is not handy as wi-fi and as it can not pass through walls the message can be cut off in between . Moreover the lights from other sources like sunlight, bulbs etc can interfere in the path of transmission[7].Installation cost along with the electricity cost and maintanance cost are also among the disadvantages of this system.

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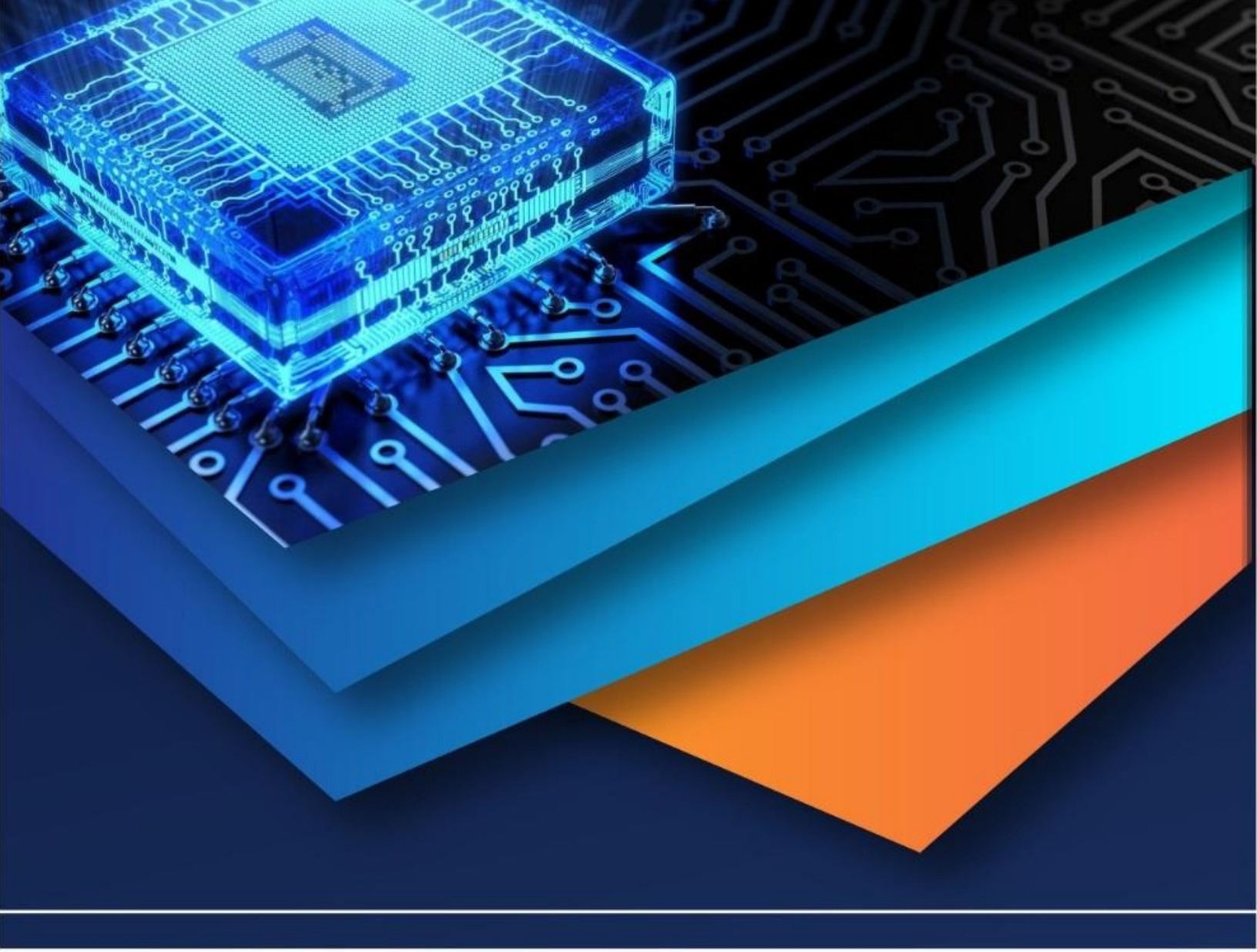
VI. CONCLUSION AND FUTURE WORK

Li-fi technology is an environemnt frienly technology which is a major step ahead towards green environemnt. Through this technique all the bulbs can be utilized for a super fast speed transmission. But, due to some of its limitations we can not totally ignore wi-fi as it is suitable for some places. Li-fi have outdated wi-fi, bluetooth , zigbee and many others in terms of speed. In future the street lights can be used as a super fast hotspot.

REFERENCES

[1] Smita Pawar ,Tyran Kinny,Franklin Puthuva, Ashore KombanDipti Beleka " Data Communication using visible light" International Journal of Student research in Technology and management Vol 3 (05), May 2015.
[2] Achal B.Kolhe "Data Transmission Using Li-fi system" International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization) Vol. 6, Special Issue 11, May 2017.
[3] Ashwini Chandankhede, Monika Adkine, Ashwini Sutone, Shivani Makhe, Mitali Ingle "Survey Of Data transfer through visible light" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 03 Issue: 03 | Mar-2016
[4] Pavas Goswami, Manoj Kumar Shukla "Design of a Li-Fi Transceiver", Wireless Engineering and Technology, 2017, 8, 71-86
[5] http://telecoms.com/opinion/what-is-li-fi-and-how-can-it-improve-5g-communications/
[6] Hadia Abd Elrahman Abdella Ali, Dr.Mohamed Abaker Hussein "Wireless Telecommunication Technologies: Li-Fi Vs. Wi-Max Vs. WiFi Vs. ZigBee Vs. Bluetooth" International journal of recent trends in engineering and research
[7] Anurag Sarkar, Prof. Shalabh Agarwal, Dr. Asoke Nath. "Li-Fi Technology: Data Transmission through Visible Light", International Journal of Advance Research in Computer Science and Management Studies, Volume 3, Issue 6, June 2015 .
[8] https://www.engineersgarage.com/blogs/li-fi-using-visible-light-lightning-fast-data-transmission
[9] Sushma L.Wakchaure, Shailaja D.Pawar, Vijay V.Thitme, Bipin B.Shinde, "Overview of Li-Fi Technology" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 04 Issue: 09 | Sep -2017

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