# LIGHT FIDELITY (Li-Fi) IN THE FIELD OF INTERNET OF THINGS (IoT) AND BIG DATA

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*Abstract: Light Fidelity (Li-Fi) is the biggest facilitator of IoT and Big Data. At present, Li-Fi actually taking technology to another level, not just that, it is likelier to do it faster while also signaling significant positive implications for the people across the world. Li-Fi is a wireless technology which enables bi-directional and high speed data transfer compared to Wi-Fi. Li-Fi uses LEDs as the source of data from transmitter side. Author believes that Li-Fi will revolutionize the world of data analytics and devices across all aspect of our lives it is not a distant that we find Li-Fi enabled light bulbs on streets, across villages, school classrooms, corporate offices, buses and trains and in all smart systems.*

## I. INTRODUCTION

The increasing transmission of mass quantities of data is putting a strain on the current technologies which uses radio frequency and infrared spectrum band for transmission of data. It is predicted that by 2019 more than 10 billion mobile devices will exchange 35 quintillion bytes of data every month and that's just mobile devices if we add IoT and Big Data to it then we can see the magnitude of problem. Now, imagine a light bulb could transfer 100 time faster data then Wi-Fi. Which can be used at the expanse of power just to bright LEDs. This technology which uses light as the medium for communication is called light fidelity (Li-Fi), so it is also called the Visible Light Communication (VLC). The Li-Fi can provide data dissemination and data collection using the energy we spend on everyday lighting.
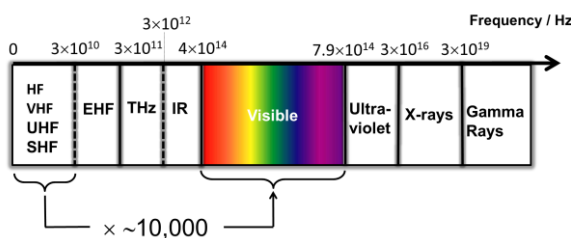


As we can see that the current technologies which operates on mainly on frequency band of 3 KHz to 300 GHz, but it is fully occupied. So it creates data traffic and puts strain on current trending technologies like IoT and Big Data. So by using Visible light we can get faster and more efficient communication speed and it is not harmful like radio frequency is because we are using light as a source to which we are familiar from millions of years. This Li-Fi technology concept was coined by Professor Herald Hass at TED Talk of

2011.He started company Pure LiFi which mainly focuses on the research in this field. Li-Fi promises transfer rate up to 224 gigabytes/second and a download speed up to 1.5gigabytes/second which makes it 100 times faster than current generation Wi-Fi. We can use this bright opportunity for development of smart systems and empowering internet of things and Big Data. This revolution will lead to cost effective data transmission in IoT with security and fast decision making in Big Data field.

## II. WHAT IS LI-FI AND HOW IT WORKS?

LED light bulbs and photo detector are major components for Li-Fi. Different types of LEDs can be used depending up on their switch ON/OFF capacity. Here current
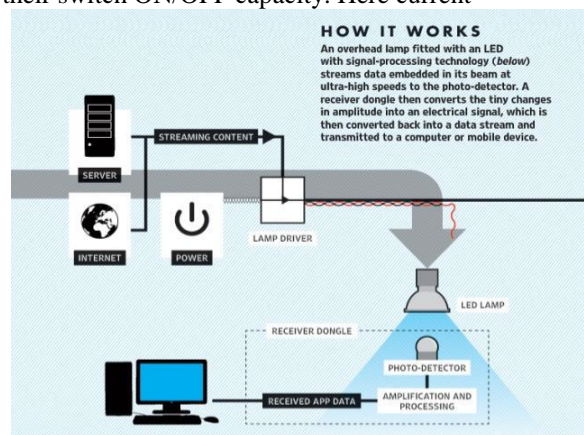


electricity is controlled due to this LED blinks, when power is applied then LED is ON so it gives bit 1 and for OFF condition of LED it shows 0 bit. Due to this rapid ON and OFF conditions LEDs are most suitable for this data transmission in addition to that LED provides illumination and transmission at low cost. Finally decoded data is transferred to destination device.
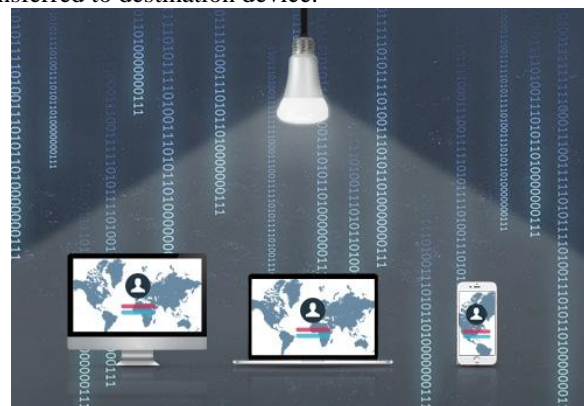


The Li-Fi market is projected to be worth over $6 million per

year by 2018. Li-Fi uses visible light in the range of 400 THz to 800 THz as optical carrier for data transmission. Due to Li-Fi it is possible to connect everything to the internet by using light as the source of data. By using this technology we can connect different objects to internet that is why we can say that Li-Fi will revolutionaries the IoT. Light cannot penetrate the wall that is why Li-Fi can be thought of as a solid security for smart systems, and recently the myth has been abolished that line of sight is problem for this Li-Fi communication.



Recently, this device LiFi-x is invented by PureLiFi Company which provides 40Mbps downlink and upward link communication. Which is the world's fastest, smallest and most secure Li-Fi system. Li-Fi is emerging technology in the field of Internet of Things and the applications and advancement is beyond the imagination.

### III. ROLE OF LI-FI IN IOT AND BIG DATA

IoT consists of mainly three parts:
- Sensors and devices
- Connectivity between network and devices
- Data

Here Li-Fi provides more speed compared to Wi-Fi so it can be used to combine all this by just converting all light sources by LEDs and connecting microchip to it which will convert this all light bulbs into data transmitter. By this we can convert billions of light bulbs in to data transmitter.
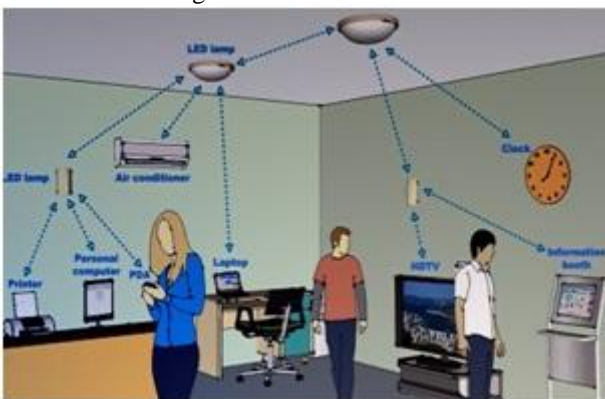


Here Li-Fi uses direct modulation without using intermediate frequencies. It uses small LEDs and photo detectors that is why it is possible to create small, low-complex transceiver units that enables any LED light to act as high speed data transmitter. Big Data is a high volume, high velocity and high variety information assets that demands cost-effective and fast rate of information processing and decision making. Big Data can be leveraged to create better value propositions based on customer data and behavior rather than simple sensors and building management optimization. Big Data is the field which can be connected to lighting and ample source of data at very cheap rate can be provided and this will transform the Big Data to a new level. As lighting will provide a backbone for data collection, it can also provide an infrastructure for data dissemination. Li-Fi can convert a collection infrastructure into a truly dynamic network. In addition Professor Herald Haas has also pointed out that this smart LED lights are cost effective and can be powered up using solar cells and batteries and as the medium of data transfer is light. It does not create any kind of electromagnetic interference like the way Wi-Fi does. Due to all this advantages Li-Fi can be thought of as the best options for advancement in the field of IoT and Big Data.

### ADVANTAGES OF USING LI-FI

Transmission data rate in Li-Fi system is more compared to Wi-Fi.
- Li-Fi gives more security to network as any outsider cannot access light, which is inside the room and light cannot penetrate through wall.
- The advantage of Li-Fi technology is in health sector because visible light is used rather than RF waves so it does not create any problem to human body and in addition to that it is also cheap, as LED bulb can be used as a source of data.
- It can also be used in nuclear reactors, as light does not create any kind of fire by operation with light.
- In underwater visible light technology can be used so people under sea can predict their location with respect to ship.
- The major advantage of this technology will be in the field of internet of things and Big Data it will transform the technology to a new level.

### DISADVANTAGES OF LI-FI
- As light cannot pass through the wall so it limits the range of area up to which data can be transferred, so in another room or building we cannot access same Li-Fi transmitter.
- External disturbances like heavy sunlight can create a problem in the path of data transmission.
- If we want to transmit data then there should not be any object between data source transmitter LED and receiver Photo detector.

### IV. IOT APPLICATIONS OF LI-FI
- In classroom using Li-Fi professor can share the notes with students using it and also it is possible to download blogs and research papers from internet with this technology.
- For security purpose we can use Li-Fi technology, whenever any obstacle will be observed between LED and Photo detector the alarm will start and security signals will be delivered.

- Li-Fi can also be used to advertise new offers of any shop and gift coupons advertisement can also be done.



- Li-Fi can also be used in higher altitude regions where we cannot use electromagnetic waves.



- For under water communication where the medium is salty we can use this technology and can predict the location and this technology can also be used in military operations.
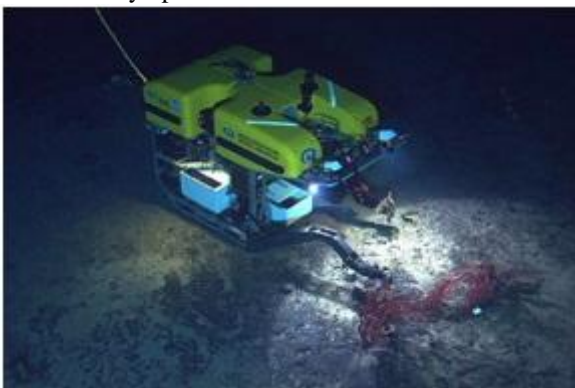


- This technology will create major impact on smart homes as security will be improved and by using light as a medium of data there will not be any problems related to human disorder. And any amount of data will be easily transmitted in real time without any delay at the speed of light.



By using light as a medium instead of RF waves this technology will bring revolution at healthcare places.



- In smart cities the cellular communication and intelligent transport system will create lot of impact. In transport system we can use communication between head light of car and back light of car and data from both of them will talk to each other and in addition will also take data from traffic signal which will result in efficient transport system with reduction in accidents.

In big corporate offices and hospitals this system can be used to navigate, as every lobby will be having a light which will transmit a data from which we can navigate to desired location.



## V. CONCLUSION

It is clear that with the advent of this Li-Fi communication and data transfer technology the IoT and Big Data fields are going to have benefits as the data stress can be reduced and data at very fast rate could be available. In addition LEDs are cheapest source of light so we can say that we are moving towards green, safe and very bright future. Where lots of devices will be easily connected and integrated with data of very high speed.

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