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# Li-Fi- Lighting the Future of Wireless Networks

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**ABSTRACT:** Light Fidelity or Li-Fi is a Visible Light Communications (VLC) framework running remote correspondences going at high speeds. Li-Fi utilizes normal family LED (light discharging diodes) lights to empower information exchange, bragging rates of up to 224 gigabits for each second. The term Li-Fi was authored by University of Edinburgh Professor Harald Haas amid a TED Talk in 2011. Haas imagined lights that could go about as remote switches. Li-Fi and Wi-Fi are very comparative as both transmit information electromagnetically. Be that as it may, Wi-Fi utilizes radio waves while Li-Fi keeps running on noticeable light. As we now know, Li-Fi is a Visible Light Communications (VLC) framework. This implies it suits a photo detection to get light flags and a flag handling component to change over the information into 'stream able' substance. A LED light is a semi-conduit light source implying that the consistent current of power provided to a LED light can be plunged and darkened, here and there at greatly high speeds, without being noticeable to the human eye. For instance, information is bolstered into a LED light (with flag handling innovation), it then sends information (installed in its shaft) at quick speeds to the photograph locator (photodiode). The modest changes in the quick diminishing of LED bulb is then changed over by the "recipient" into electrical flag. The flag is then changed over once again into a binary data stream that we would perceive as web, video and sound applications that keep running on web empowers gadgets. While some may believe that Li-Fi with its 224 gigabits for each second leaves Wi-Fi in the clean, Li-Fi's restrictive utilization of obvious light could end a mass take-up. Li-Fi signals can't go through walls, so keeping in mind the end goal to appreciate full network, proficient LED bulbs should be set all through the home. Also, Li-Fi requires the light is on at all circumstances to give network, implying that the lights should be on amid the day. Besides, there is an absence of lights, there is an absence of Li-Fi web so Li-Fi takes a hit with regards to open Wi-Fi systems. In a declaration yesterday, an augmentation of standard Wi-Fi is coming and it's called Wi-Fi HaLow. This new venture cases to twofold the scope of availability while utilizing less power. Because of this, Wi-Fi HaLow is apparently ideal for battery fueled gadgets, for example, smart watches, cell phones and fits Internet of Things gadgets, for example, sensors and brilliant applications. Be that as it may, it's not all fate and melancholy! Because of its noteworthy rates, Li-Fi could have a tremendous effect on the web of things as well, with information exchanged at significantly larger amounts with much more gadgets ready to interface with each other. Besides, to its shorter range, Li-Fi is more secure than Wi-Fi and it's accounted for that inserted light bars reflected off a surface could at present accomplish 70 megabits for every second.

### I. Li-Fi

Li-Fi or Light Fidelity is a Visible Light Communications (VLC) system which provides wireless communications and can travel at ultra-high speeds.

Light Fidelity utilizes basic family light emitting diodes (LED) lights that empower exchange of data, expanding velocities of up to 224 gigabits per second.

The term Light Fidelity was presented by Professor of University Edinburgh Harald Haas amid a TED Talk in 2011. Haas saw the possibility of lights to act as a wireless routers.

Later, after four years of research, Haas set up an organization pureLiFi with the point "to be the world leader in Visible Light Communications technology" in 2012.

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## II. WORKING OF Li-Fi

Wi-Fi and Li-Fi works very comparable as they both transmit information electromagnetically. But, Li-Fi runs on visible light like LED bulb while Wi-Fi utilizes radio waves.

As we know that, Li-Fi is a Visible Light Communications (VLC) system. It comprise of a light source toward one side which could be a LED and a photo-detector that accepts light signals that are transmitted by light source. It also has a signal processing element that converts the coming data into 'stream-able' content.

A light emitting diodes (LED) light bulb is fundamentally a semi-transmitter light source implying that the consistent current of electricity provided to a LED light bulb can be plunged and diminished, up and down at ultrahigh speeds, without being visible to our eye's. Suppose, data is fed into an LED light bulb (with signal processing technology), it then sends the data (embedded in its beam) at very high speeds to the photograph locator (photodiode).

The minor changes in rapid dimming of LED bulbs is then changed over by the "receiver" into electrical signals.

The signals are then changed over into a binary data stream that we would perceive as web, video and sound applications that runs on devices which have internet.

## III. ADVANTAGES OF Li-fi

- **Efficiency:** Li-Fi deals with visible light technology. Since homes and workplaces are already having LED bulbs for lighting purposes, the same source of light can be utilized to transmit data. Hence, it is extremely productive in terms of costs as well as energy. Light should be on to transmit data, so when there is no need for light, it can be reduced to a point where it appears off to our eye, however it is still on and working.
- **Availability:** Wherever there is a light source, there can be Internet. Light bulbs are available everywhere – in our homes, offices, shops, shopping center and even planes, which means that a very high-speed data transmission could be accessed everywhere.
- **Security:** One of the main advantage of Li-Fi is it's security. Since light cannot pass through opaque structures, Li-Fi Internet is accessible only to the users within a room and can't be ruptured by users in different rooms or buildings.

## IV. DISADVANTAGES OF Li-fi

- Internet can't be utilized without a light source. This could constrain the areas and situations in which Li-Fi could be used.
- As we know Li-Fi uses visible light, and light cannot penetrate walls, the signal's range is restricted by physical barriers.
- Other sources of light may interfere with the signal. One of the biggest potential drawbacks is the interception of signals outdoors. Daylight will interfere the signals, which results in interrupted Internet.
- A whole new infrastructure for Li-Fi would need to be constructed.

## V. Li-Fi vs Wi-Fi

While many of us can think that Li-Fi with its 224 gigabits per second leaves Wi-Fi behind, Li-Fi's exclusive use of visible light could halt a mass uptake.

Li-Fi signals can't go through walls, so in order to use full connectivity, capable LED bulbs should be placed throughout the home. and also Li-Fi requires the light bulb to be switched on at all times to provide connectivity, meaning that the lights will need to be on during the whole day. Therefore, where there is absence of light bulbs, there is absence of Li-Fi internet so Li-Fi does take a hit when it comes to open Wi-Fi networks.

This new project says to double the range of connectivity while utilizing less power. Because of this, Wi-Fi HaLow is reportedly ideal for battery powered devices such as smart watches, smartphones and fits itself to Internet of Things devices. For example sensors and smart applications.

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But it's not all doom and gloom! Due to its great speed, Li-Fi could have a tremendous effect on the internet of things, with data transferred at very high speed with even more devices able to connect to one another. And even more, because of its shorter range, Li-Fi is more secure than Wi-Fi and it's reported that embedded light beams reflected off a surface could still achieve 70 megabits per second.

## VI. THE FUTURE OF Li-Fi

In November 2014, Li-Fi pioneers pureLiFi united with French lighting organization Lucibel intending to bring out Li-Fi enabled products, by the end of 2015.

pureLiFi as of now have two items available: Li-Flame Ceiling Unit to connect to an LED light fixture and Li-Flame Desktop Unit which connects to a device via USB, both expecting to give light and availability in one gadget.

In addition, with quicker availability and data transmission it's an interesting space for organizations. The integration of internet of things devices and Li-Fi will give a wealth of chances for retailers and other businesses alike. For example, shop owners could transmit data to multiple customers' phones quickly, securely and remotely.

Li-Fi is apparently being tried in Dubai, by UAE-based broadcast communications supplier, du and Zero1. Du cases to have effectively given internet, audio and video streaming over a Li-Fi connection.

Besides this, reports suggest that Apple may manufacture future iPhones with Li-Fi capabilities. A Twitter user found that within its iOS 9.1 code there were references to Li-Fi written as 'LiFiCapability' hinting that Apple may integrate Li-Fi with iPhones in the future.

Regardless of whether Li-Fi will experience its buildup is up in the air.

## VII. APPLICATIONS

- Underwater communications: Since radio waves can't be utilized under water because these waves are strongly absorbed by sea water within feet of their transmission and this renders it unusable underwater but LIFI is suitable for underwater communication

- Health sector: Since WIFI is not safe to be used in hospitals and other various health care sectors because it penetrates human body. LIFI can be actualized and well suit in this segment.

- Internet anywhere: road lights, light of vehicles can be utilized to get to internet anywhere in footpaths, roads, shopping centers, anywhere where light source is available.

- Safety and administration: it can be utilized to refresh activity data at practically every moment and it will be simple for police to manage activity and catch the person who breaks the one who breaks the rule.

## VIII. USES IN VARIOUS AREAS

Li-Fi can be utilized in the places where it is hard to lay the optical fiber like clinics. In operation theatre Li-Fi can be utilized for modern medical instruments. In traffic signals Li-Fi can be used which will communicate with the LED lights of cars and the number of accidents can be decreased. Thousand and millions of street lights can be exchanged to Li-Fi lamps to transfer data. In aircraft Li-Fi can be used for data transmission. It can also be used in petroleum or chemical plants where other transmission or frequencies could be risky.

## IX. CONCLUSION

The possibilities are numerous and can be investigated further. If this technology can be put into daily practical use, then every bulb can be utilized for something like a Wi-Fi hotspot to transmit wireless data and we will continue toward the cleaner, greener, and more secure and brighter future. The idea of Li-Fi is currently attracting a great deal of interest, not least because it may offer a genuine and very efficient alternative to radio-based wireless. As there are growing number of people and their many devices access wireless internet, the airwaves are becoming increasingly clogged, making it harder to get a reliable, high-speed signal. This may comprehend issues, for example, the lack of radio-frequency bandwidth and also allow internet where traditional radio based wireless isn't permitted, for example aircraft or hospitals. One of the weaknesses however is that it only work in direct line of sight.



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