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An Over View of Li -Fi Technology is the Future of Secure Internet

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ABSTRACT: The Li-Fi (light fidelity) technology was proposed by the German Scientist namely Harald Haas. The main function of this technology is to transmit the data via light. This technology is idyllic for high-speed wireless communication in a restricted region, and it offers many benefits over Wi-Fi technology such as high bandwidth, ease of use, efficiency, and safety. These systems can communicate from street lights to auto-piloted cars using their headlights. As the light speed is superior hence the data communication speed is also faster in the existing system. Furthermore, this technology can be implemented for speedy data access for the laptops, and gadgets that will be transmitted during the beam in a room.

KEYWORD: light fidelity technology, Internet security system of future, future technology of wireless system, wi-fi, VLC(VISIBLE LIGHT COMMUNICATION), LED, RF(RADIO FREQUENCY).

I. INTRODUCTION

Li-Fi-light fidelity is similar to Wi-Fi technology and it is one of the future wireless communication technologies. The main feature of this technology includes fully networked, bidirectional and high-speed wireless. Nowadays, the most trending domain in wireless communication is Wi-Fi and internet users are also being increased every year. For obtaining better speed, efficiency, bandwidth, Li-Fi technology has evolved. The data transmission in this technology can be done using light because the light intensity changes quicker than the human eye for capturing. The range of data transmission in Li-Fi is faster 100 times than Wi-Fi.

II. RELATED WORK

Li-Fi system mainly includes two parts namely the transmitter and receiver. The input signal at the transmitter section can be modulated with a specific time period then send the data using LED bulbs in 0's and 1's form. Here, the flashes of LED bulbs are denoted with 0's and 1's. At the receiver end, a photodiode is used to receive the LED flashes strengthens the signal & gives the output.

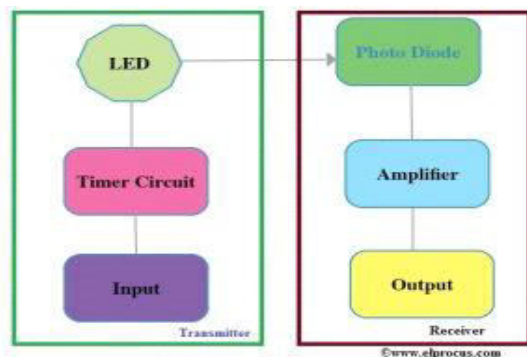
The block diagram of Li-Fi system is shown below, and the transmitter section includes the input, timer circuit, an LED bulb. The input of the transmitter can be any kind of data like text, voice, etc. The timer circuit in this section is used to provide the necessary time intervals among every bit, and these are transmitted to the receiver end in the form of LED flashes. The receiver section includes photodiode as well as amplifier. Here, photodiode receives the LED bulb flashes then changes the flashes into electrical signals. Finally, the amplifier receives the signals from the photodiode and amplifies to provide the output.

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III. PROPOSED

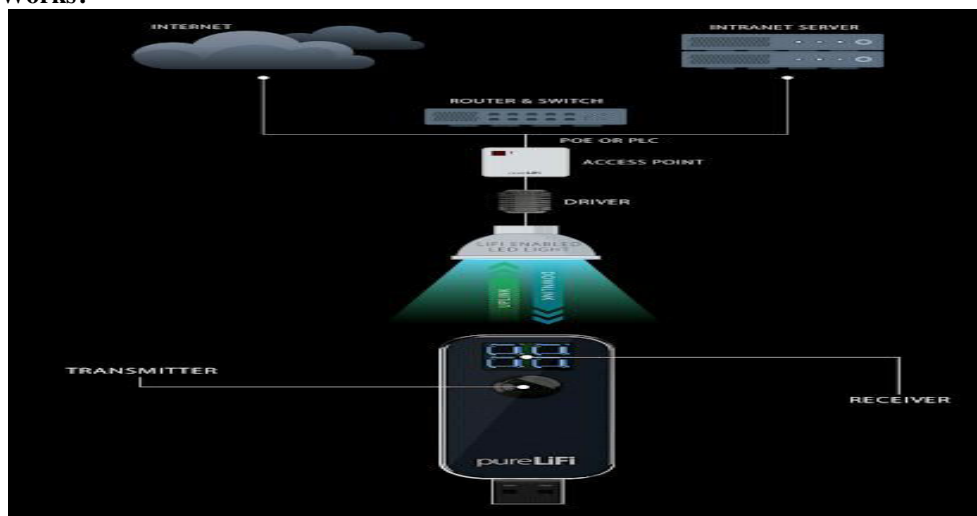
LiFi is high speed bidirectional networked and mobile communication of data using light. LiFi comprises of multiple light bulbs that form a wireless network.

When an electrical current is applied to a LED light bulb a stream of light (photons) is emitted from the bulb. LED bulbs are semiconductor devices, which means that the brightness of the light flowing through them can be changed at extremely high speeds. This allows us to send a signal by modulating the light at different rates. The signal can then be received by a detector which interprets the changes in light intensity (the signal) as data.

The intensity modulation cannot be seen by the human eye, and thus communication is just as seamless as other radio systems, allowing the users to be connected where there is LiFi enabled light. Using this technique, data can be transmitted from a LED light bulb at high speeds and secure.

IV. DISCUSSION

How Li-Fi Works?





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Li-Fi is a VLC (visible light communications) system and the speed of this system is very high. Li-Fi uses normal LEDs to allow the data to transfer and increase the speed up to 224 Gigabits/sec. The data transmission of this technology can be done via illumination. The essential devices of this system are the bright light emitting diodes. The ON/Off activity of LEDs permits a type of data transmission in the form of binary codes but the human eye cannot recognize this transform & the bulbs appear with a stable intensity.

Differences between Li-Fi & Wi-Fi :-

The Differences between Li-Fi and Wi-Fi include the following.

The Bandwidth Expansion of Wi-Fi technology is limited and exceptional for Li-Fi

The Speed of the Wi-Fi is 54-250 Mbps and >1-3.5 Gbps for Li-Fi

The Data Density of Wi-Fi technology is low and high for Li-Fi

The Range of Wi-Fi is medium and low for Li-Fi

The Security of Wi-Fi is medium and excellent for Li-Fi

The power availability of Wi-Fi is low and high for Li-Fi

The ecological impact of Wi-Fi is medium and low for Li-Fi

The cost of the Wi-Fi is medium and low for Li-Fi

The network topologies of Li-Fi and Wi-Fi technologies is a point to point.

	LI- FI	WI- FI
SPEED	1-3.5 Gbps	54-250 Mbps
RANGE	10 meters	20-100 meters
IEEE STANDARD	802.15.7	802.11b
SPECTRUM RANGE	10000 times than WI-FI	Radio spectrum range
NETWORK TOPOLOGY	Point-to-Point	Point-to-Multi Point
DATA TRANSFER MEDIUM	Use light as a carrier	Use radio spectrum
FREQUENCY BAND	100 times of THz	2.4 GHz

Table 1: Comparison between Li-Fi and Wi-Fi

Advantages of Li-Fi :-

The advantages of Li-Fi include the following.

Speed-The speed of the Li-Fi is very high, and we can watch the videos without buffering.

Security- The light of the Li-Fi doesn't run through the partition, therefore, it is more protected and hacking is not possible.

Risk-free-Li-Fi utilizes light waves which are harmless.

Consistent- The data transfer is more protected.

Disadvantages of Li-Fi :-

The disadvantages of Li-Fi include the following.

Apart from several benefits, the Li-Fi technology is facing several problems. It requires LOS (line of sight), as well as the receiver, would not be a move in inside.

The main problem is how the receiver will send the data back to the transmitter section.

Another disadvantage of this technology is an interference of exterior light sources such as normal bulbs; sunlight in the lane of communication will cause intermission in the transmission.

It doesn't work in the dim areas.



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Li-Fi Technology Applications :-

The Li-Fi router applications over Wi-Fi are promising as well as unlimited for the wireless communication which includes the following.

Traffic Management & Road Safety

Medical Applications

Aviation

Communication Underwater

Elegant Lighting

Interior map-reading system for blind people

In dangerous Environments or In Sensitive regions

Transportations

Industrial Areas

At present, the concept of Li-Fi technology is attracting a lot of wireless internet users due to its genuine features. Further, it can be explored for laptops; gadgets which can be transmitted through the light in the room by using Li-Fi. Here is a question for you, what are the advantages of Li-Fi over Wi-Fi?

How much does LiFi cost?

pureLiFi is currently working towards miniaturisation of LiFi technology. Ultimately the end goal is to have LiFi in every mobile device. This means that the technology will be affordable for integration into handsets, tablets and laptops.

Ultimately the end consumer will see minimal or no cost associated with LiFi as the goal is to have LiFi embedded in every wireless mobile device.

Today companies can speak to pureLiFi about working with us on proof of concept projects and other types of installations. These installations are priced based on individual requirements.

Can we see LiFi lights flicker?



The LED lights used to transmit LiFi signals are modulated at such a fast rate that the eye cannot perceive the modulation or “flicker”. This is similar to the way our eyes do not interpret the break between film frames in a motion picture. Just as you see a smooth motion on the cinema screen, you will see an uninterrupted source of steady light streaming from a LiFi enabled luminaire.

As a comparison, the lowest frequency at which the lights are modulated is 1MHz and this is 10,000 times higher than



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the refresh rate of our computer screens.

How does LiFi work in a bright room with sunlight?

LiFi can operate in daylight and even in direct sunlight conditions, as the modulated light can still be detected. LiFi relies on detecting the fast changes in light intensity and not on the absolute or slowly varying levels caused by natural disruptions in daylight or sunlight. LiFi technology modulates the light at very high rates and sunlight is constant light and therefore can be filtered out at the receiver.

Our team at pureLiFi has tested our receivers outdoors under 77,000 Lux of sunlight.

How does LiFi work when you turn off the lights?

If all power to a light is turned off then there is no LiFi. However, LiFi technology can be enabled to dim low enough that a room will appear dark and still transmit data. There is consistent performance between 10 and 90 percent illumination.

Currently, pureLiFi's technology provide communications at light levels down to 60 lux. For comparison the British standard for minimum light level for reading is 400 lux.

There are also other options for using invisible parts of the light spectrum such as infra-red, which is currently already being used for sending information back to the lightbulb (uplink).

Will Li-Fi work in my pocket?

No LiFi does not work in your pocket, unless you have a transparent suit.

LiFi is a complimentary technology that works alongside other wireless technologies such as Wi-Fi. If the light signal to a LiFi enabled device is below the receiver's threshold then it will not receive data. In that instance, radio systems or cellular networks, if available, will continue to deliver data.

However, the moment the device begins to receive light from a LiFi light bulb, then the device will resume high speed communications using light as an additional communications medium.

Is Li-Fi a line of sight technology?

Light bounces off of surfaces and therefore LiFi is not strictly a line-of-sight technology.

LiFi is a cellular communication system and the data rate is not dependent on the line of sight but on the signal quality at the device. Signal quality can be defined by the ratio of the desired data vs any interfering data and noise.

How is Li-Fi more secure than other wireless technologies?

pureLiFi is developing the security components and technologies that enable security specialists to deliver more secure wireless communications.

LiFi is significantly more secure than other wireless technologies because light can be contained in a physical space. Our doors and windows can be shut, and physical barriers and adjustments can be implemented to contain and protect the light. We can create the conditions that allow us to shut the door on our wireless data.

It should be understood that the existing security protocols for encryption and authentication can be leveraged in LiFi systems to provide even more secure wireless systems.

Is LiFi a bidirectional technology, and what does that mean?

LiFi is bidirectional wireless communications technology that allow high speed transmission in both uplink and downlink simultaneously.



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How does the backhaul work?

There are two solutions for providing backhaul for LiFi wireless communications.

Currently, power over Ethernet (POE) is the optimal solution for driving the network backhaul and therefore the preferred option for new installations. Power line communications (PLC) is the preferred option for retrofit installations. PLC can be used for by sharing the available capacity between lamps attached to any given ring main.

The long-term backhaul is resolved by using Power over Ethernet in new offices, which is proving more efficient for smart buildings and lighting. An example is the Edge Building in Amsterdam that is the current headquarters of Deloitte. The building has over 6,000 PoE connected lighting fixtures, which resulted in a 50% reduction in installation time as well as a 25% installation cost saving. This is the future.

Enabled by pureLiFi technology, the “Cloud RAN” architecture can also help alleviate the pressure on the backhaul.

What is uplink?

Uplink is when information is sent back from the client (user device) This enables bi-directional LiFi communication which is key to enabling a truly wireless internet browsing experience.

pureLiFi uses invisible parts of the light spectrum to perform uplink called infra-red (IR).

What is Data Density?

Data density is the wireless capacity available in a particular area and is important because it directly affects the quality of service (QoS) achievable for each user.

Data densities offered by LiFi allows for significantly greater capacity. For example in a room with 6 LiFi integrated lights, each light transmits 42 Mbps leading to a total capacity of 252 Mbps in that room. This results in a reliable and faster user experience....

V. CONCLUSIONS

The probabilities are numerous and therefore for the exploration can be done. If his technology might be put into practical utilize, every bulb can supply something like a Wi-Fi hotspot to help transmit wireless data and we will precede toward the solution, greener, safer and better future. The concept of Li-Fi is currently attracting lots of interest, not least because it may offer a genuine and also efficient alternative to radio-based Wi-Fi.As a growing number of individuals and their manydevice access wireless internet, the airwaves have grown to be increasingly clogged, making it increasingly more difficult to get an honest, high-speed signal. This may solve issues like the shortage of radio-frequency bandwidth furthermore permit web where conventional radio based remote isn't allowed for example aircraft or hospitals. Among the shortcomings however is whose only work in direct distinct sight?

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