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Light- Fidelity Technology

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ABSTRACT

Li-Fi is the short form of Light-Fidelity. The term Li-Fi was coined by a German physicist named Harald Haas during a 2011 TEDGlobal talk in Edinburgh. Li-Fi could be a wireless communication technology that has data transmission through illumination by sending data through an LED light bulb that varies its intensity faster than the human eyesight. Li-Fi could be a light communication system that's capable of transmitting data at a betterspeed. For example: Li-Fi transmits data at higher speed over the visible radiation, ultraviolet and spectrum. This paper focuses on analysing Li-Fi based system and understanding its performance with relation to existing technology and also how Wi-Fi may be replaced by Li-Fi. Li-Fi technology is ideally for prime speed wireless communication in avery restricted region and its many benefits over Li-Filike easeof use, efficiency, high bandwidth and security. These light based systems can communicate from street lights to auto-piloted cars headlights.

KEYWORDS: Li-Fi, Data transmission, Efficiency and Bandwidth

INTRODUCTION

Wireless devices are highly reliable and secure so as to produce interface with each other leading to connection loss. The Wi-Fi services in and around covering the distances from 10 to 100m distance to attach computers, laptops, mobiles etc. The challenges faced by Wi-Fi in today's time are security, availability, Interpretation, efficiency and capacity it also increases the hotspot connectivity which is proportional to Wi-Fi traffic. This increases the possibility of Cyber threat like stealing Wi-Fi password and penetrating into inertial systems which eventually means system attack. So as to beat this problem the most effective solution was Li-Fi. Li-Fi could be a subsidiary product of optical wireless communication technology that semiconductor diode medium to deliver network, communication the identical as Wi-Fi. This technology is predicted on the spectrum because it is restricted to the illumination to the aim and not adjusted to the mobile communication Technologies that allow roaming between Li-Fi cells, are referred to as handover.

The light waves cannot penetrate throughwalls which translate to the smaller range. Li-Fi has advantage over electromagnetic sensitive areas like aircraft cabins, hospitals and atomic energy plant without causing electromagnetic interference. Both Wi-Fi and Li-Fi transmit data through spectrum but Wi-Fi uses radio waves and Li-Fi useslight, actinic ray and infrared light. Wi-Fi is full near capacity whereas Li-Fi has nolimitations to capacity. The light frequency is 10000 times larger than frequency spectrum.

History

Visible Light Communication technology uses visible light for data transmission. Even though this concept is considered as new form of technology, it can be traced back to the invention by Mr. Alexander Graham Bell along with his assistant Mr. Charles Sumner Tainter, where they contrived Photophone. The photophone transmits speech wirelessly through beam of light. This device operates upon modulated light instead of modulated electrical signals. The sound waves are directed to a mirror which causes similar vibrations upon a mirror and the mirror starts vibrating. The sunlight is directed to the vibrating mirror and projected back to the sound receiving device and converted back to sound.

The earliest work on VLC technology was began at Nakagawa Laboratories in Keio University Japan.This technology is primitively focused on transmitting data through light emitting diodes Japanese researchers proposed the concept of communication through visible light in 2000 and in 2009 they were able to create a high speed communication Technology from light Communication Technology that reached 100 MB/s. In 2006, CICTR researchers at Pennsylvania State University proposed the combination of power line transmission and LED Technology[7] for efficient data transmission, data access, increased bandwidth, low cost and efficient lighting. In 2008, the European Union research project on VLC technology known as Omega. The aim of the project was to develop Ultra high speed home accessible network which is capable of Speed upto 1 GB/s. The conception test network speed recorded was 1.25 GB/s and were able to reach the transmission speed of 300MB/s. The US National Science Foundation on the same site proposed various projects on smart lighting Communications to improve wireless communication Technology. Similarly, numerous research projects were conducted within EU and US that led to the invention of Li-Fi.

VLC is a superordinate term that comprises all communications technologies that use visible light. The basic principles of VLC Technology are incorporated into Li-Fi and were further carried by professor Harald Haas. Another word for experiment they attempted tested .They experimented search into use of light as a medium of two way data transmission which led to the invention of Li-Fi Technology. Although Li-Fi Technology was not invented at the moment, it was proposed by professor Haas in Ted Talk during 2011. Where he mentioned that there will be a wireless data transmission from every light bulb. To demonstrate the working of new technology he provided live demonstration by streaming high-definition video through an LED lamp. Professor Harald Haas helped the company to market on Li-Fi technology. This marketing company was named as pureVLC, and later renamed as pureLi-Fi. This company manufactures the original equipment to commercialize Li-Fi product by integrating with existing LED lighting systems. PureLi-Fi was able to produce a variety of life products by integrating with Li-Fi into existing devices.

WORKING OF LI-FI:

Li-Fi works by making use of visible light for transmission of data. It is possible to use a VLC system for data transmission. There are two qualifying components in the VLC system.

In order to receive a light signal at least one device should contain a photodiode.

For signal transmission a light source should be equipped with a Signal Processing Unit.

A visible light communication resource can be in the form of fluorescent bulb or LED. LED bulbs are the prominent VLC resource [6], where a resilient lifi system requires high rates of light output. Fluorescent bulbs emit light during a much wider band of wavelengths, which makes it a comparatively less efficient source of illumination

than LED. LED, on the opposite hand, could be a light that emits light during a very narrow band of wavelengths, making it a more efficient light.LED is additionally a semiconductor, which means that it can amplify strength and switch rapidly. This is often a vital quality to seem for during a VLC light because LiFi relies on the constant stream of photons emitted as visible radiation for the transfer of information.To strike a balance between VLC light and household illumination, this current still because the optical output is modulated at extremely high speeds, making it detectable by the photodiode device and converted back to electrical current, but unperceivable by the human eye. Once these signals are received and demodulated, they will now be converted into endless stream of binary data that contain videos, images, audio, text, or applications that are readily-consumable on any internet-enabled device.

Because LiFi technology continues to be in its relative infancy, there's still much room for growing innovation. One proposed innovation to the prevailing technology includes creating a bidirectional communication system kind of like conventional broadband and WiFi. Another proposed innovation is that the re-engineering of the multi-colored RGB LEDs to send and receive data on a wider range of signals than the single-colored phosphor-coated white LEDs.

PROBLEMS OF WIFI:

- Security:Security may be a big issue while using wireless networks. If a wireless network isn't installed correctly or maintained correctly, it's going to cause severe security threat. Connecting physical components like wires isn't required by a wireless network. They only need a wireless adapter which automatically increases the danger of hacking since hackers can have easily accessibility of the network.If there's password protection for the network, then situations take a turn for the more serious.
- Limited Bandwidth: Wireless networks cannot support VTC or video teleconferencing since they need minimal bandwidth. It also has limited expandability since there's an absence of wireless spectrum for occupying. The bandwidth gets stolen by neighbors if the network isn't password protected
- Speed: The speed of the wireless network is slower than the speed of the wired network. Transferring or sharing files is way slower in a very wireless network. The speed also depends on the placement of the user concerning the network. The further the user is from the network, the more serious the connection becomes. This can be a large problem for giants spaces or building
- Health issues: Due to its hazards radiation which can affect to skin and other parts of the body. It's possibly affect the pregnant women
- Capacity - the actinic ray spectrum is 10000 times wider than the spectrum of radio waves. The light sources are already installed. Therefore Li-Fi incorporates a greater bandwidth and equipment which is instantly available.
- Availability- light sources are readily available within the world the billion of light bulbs may be replaced with LED bulbs.

PROS OF LI-FI:

To overcome the problems of wifi, Li-Fi was found and below represents the features or advantages of Li-Fi:

- Efficiency: Efficiency use of energy consumption because of the employment of LED illumination which is already in use for lighting purposes. Hence the transmission of knowledge would force negligible additional power or energy.

- High speed: The technology uses bandwidth that's not in use currently. Hence, low interference wider bandwidth, and high-intensity output are key that are features.
- Availability: Because the light is offered everywhere, availability isn't difficult. Hence whenever there's a lightweight source, there'll be the internet.
- Cost-efficient: This Technology requires few components for its work. The technology also you negligible additional power for the transmission. Overall, utilization of this technology becomes cost-efficient.
- Security: As light cannot withstand Opaque structures, Li-Fi internet is out there only to those within a confined area. This internet cannot be intercepted and misused outside the world under operation.
- Futuristic: this technology encompasses greater scope in the future because of the extent of growth within the use of LEDs. Overall, it's considered a sustainable model for internet access because it Incurs low cost and offers high efficiency.

CONS OF LI-FI:

- Limited range: The fact that light can't penetrate through could be a decent thing when it involves security but it also means Li-Ficontains a very limited range. Which means you'll be able to use only use it effectively in closed spaces. In establishments, lights must be statically placed in rooms and halls to expand the scope of Li-Fi network. In Open Spaces, Wi-Fi's coverage can go up to 32 m but Li-Fi I can only go to 10m.
- Limited compatibility: Since Li-Fi may be new technology, but not many devices can be compatible with it. Most devices that we use now still use hardware for Wi-Fi networking and it's unlikely that we are going to see Li-fi-enabled personal devices within the next number of years.
- Interference from other light sources: Li-Fi is nice indoor purpose, as long you're in an inside area with minimum or ambient light. If your room has windows or if you're sitting on the balcony, there are fair chances that light from outside may mess along with your Li-Fi signals.
- Requires additional devices: There's no customer Smartphone or computer with built-in Li-Fi support yet. one would want additional devices to use it on their laptop two signal emitters on both end (one being the device and other being the already existing LED) and two signals receiver (again one for the laptop and other hooked at the your ceiling).
- Light interference and lightweight pollution: Different buttons of Li-Fi are powerless to light obstruction and advancement of sunshine contamination. Observe that despite incontrovertible fact that this innovation is invulnerable to electromagnetic impedance, different wellsprings of sunshine may interfere sign. Daylight can horn in light signals created by a Li-Fi empowered LED light. The relating recipient may struggle handling the signs. Web interference is convincible. Besides on Grounds that empowered LED light could remain, they will offer further to light contamination, particularly whenever set at Higher Splendor to create up for conceivable impedance with other light sources.

CONCLUTION

Li-Fi is that the upcoming and ongoing Technology acting as competent for various other developing and already invented Technologies. Since light is the major source for transmission during this technology its very

advantages and implementable in various fields that can't be e finished the Wi-Fi and other Technologies. Hence the longer term applications of the life I is rejected and extended to different platforms like education fields medical fields in industrial areas and many other fields. the probabilities are numerous and can be explored further if this technology may be e put into practical use every bulb will be used something sort of a Wi-Fi hotspot to transmit wireless data and that we proceed towards the cleaner greener safer brighter future.

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