

Li-Fi: The Emerging Technology and the green avatar of Wi-Fi

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Abstract— The main objective is to provide India and all over world free laptops and computer low cost secure digitally and fast data transfer if Li-Fi technology develop in India would become a most powerful IT center in the world. These days almost all the peoples are using internet to perform their task through wired or wireless network .as number of people as users are increases in using wireless network, the speed is decreasing. As per IEEE .802.11n, Wi-Fi gives the speed of 150mbps which is not sufficient to meet the desired of the multiple users. To overcome this limitation of WI-FI, the new concept of LI-FI technology is introduced. LI-FI stands for Light Fidelity. This technology uses LED bulbs the concept of visible light communication.

Keywords— wireless fidelity (Wi-Fi), light fidelity (li-fi).

I. INTRODUCTION

Li-Fi stands for Light Fidelity. The technology is very new and was proposed by the German physicist Harald Haas in 2011 TED (Technology, Entertainment, Design) Global Talk on Visible Light Communication (VLC). Li-Fi is a wireless optical networking technology that uses light emitting diodes (LEDs) for transmission of data [1]. The term Li-Fi refers to visible light communication (VLC) technology that uses light as medium to deliver high-speed communication in a manner similar to Wi-Fi and complies with the IEEE standard IEEE 802.15.7. The IEEE 802.15.7 is a high-speed, bidirectional and fully networked wireless communication technology based standard similar to Wi-Fi's IEEE 802.11. Optical wireless communications (OWC) is a form of optical communications in which unguided visible infrared (IR), or ultra violet (UV) LIGHT is used to carry a signal (OWC) system operating in the visible band (390-750nm) are commonly referred to as visible light communication (VLC) VLC a system take advantage of light emitting diodes (LEDs) which can be added at very high speed without any recognizing effect on the light output and visible light communication can be positively used in the wide range of application including public are that is wireless local area , personal area and etc.

Li-Fi stands for LIGHT FIDILITY the technology which sends data through LEDs, bulbs which varies its intensity faster than which the human eye can follow [2]. Li-Fi technology used for label the cheap and the fastest wireless communication system which is the optical version of Wi-Fi. Li-Fi Technology is a transmission of data through exploring by taking fiber out from fiber optics as light reaches nearly everywhere so along with light data communication can also go easily.

The professor of mobile communication (university of Edinburg 1st time in UK displayed publicly the proof of light fidelity method of visible light communication, light is branch of optical wireless communication which is an emerging technology LIFI technology provides transmission of data through illumination by sending data through an LED light bulb that varies in intensity faster than the human eye can follow [3-5].

WI-FI is very good for general wireless coverage within buildings, whereas LI-FI is ideal for high density wireless data coverage in confined area and from radio interference issues [6]. Li-Fi provides better bandwidth, efficiency, availability and security than Wi-Fi and has already achieved blisteringly high speed in the lab. Visible light being safer, they can also be used in places where radio waves can't be used such as petrochemical and nuclear plant, hospitals and aircraft, where most of the control communication is performed through radio waves By leveraging the low-cost nature of LEDs and lighting units there are many opportunities to exploits this medium, in public area from the street light the headlights can communicate with each other in auto piloted cars Haas envisions a future where data for all device will be transmitted through the light in a room But, Li-Fi is still in its infancy, Some fields where it seems very usable useful are street and traffic lights. Traffic lights can communicate to the vehicles and with each other. Vehicles having LED-based headlights and tail lamps can communicate and exchange information which can prevent accident [7].

Through Li-Fi, traffic control can be made intelligent and real-time adaptable. Basically, each traffic and street light post can be converted into access points which can convert roadsides into wireless hot spots [8].

If we succeed to put Li-Fi into practical use, every LED lamp (indoor or outdoor) can be converted into something like a hot spot to transmit data to every mobile device to achieve universal broadband communication between devices. Also, it presents another unique possibility: transmitting power wirelessly, wherein the smartphone will not only receive data through Li-Fi, but will also receive power to charge itself [9].

LI-FI or light fidelity, refers to wireless communication system using light from light – emitting diode as a medium instead of traditional radio frequencies, as in technology using the trademark Wi-Fi. Li-Fi is expected to be ten times cheaper than Wi-Fi, Li-Fi has an advantage of being able to be used in electromagnetic sensitive areas such as in aircraft and nuclear power plants without causing interference. The light wave cannot penetrate walls which make a much shorter range, through more secure from hacking, relative to Wi-Fi. While the US federal communication commission has warned of a potential spectrum crisis because Wi-Fi is close to full capacity, Li-Fi has almost no limitation on capacity. The visible light spectrum is 10000 times larger than the entire radiofrequency spectrum. Researchers have reached data rate of 3.5 GBPS and have set a goal of reaching to 6Gbps. The Li-Fi market is projected to be worth over \$6 billion per year of 2019. Low reliability and high installation cost are the potential drawbacks. Li-Fi is now part of the visible light communication (VLC) PAN IEEE 802.15.7 standard. Li-Fi is typically implemented using white LED light bulbs. These devices are normally used for illumination by applying a constant current through the LED. However, by fast and subtle variation of current, the optical output can be made to vary at extremely high speeds. This variation is used to carry high-speed data. In October 2011 a group formed of companies and industries, to promote high speed wireless systems and to overcome the limit of Wi-Fi availability, the Li-Fi consortium. Many companies offered VLC products, in 2012 the VLC technology was launched using Li-Fi by August 2013 the data rate of over 1.6 Gbps was demonstrated over single colour of LED, in 2013 September press release said do not require that line of sight condition that Li-Fi or VLC systems in general [10]. In 2013 it was reported that Chinese are working in its manufacturing.

II. LI-FI STANDARDS

- A. Li-Fi is also way faster, the latest Wi-Fi standard, 801.11ac, has maximum speed of about 867 Megabits per sec for a typical handheld. Li-Fi, meanwhile, can reach speeds up to 3.5Gbit/s per colour – meaning a typical Red-Green-Blue (RGB) LED can emit speeds up to 10.5Gbit/s – more than 10 times faster than the latest Wi-Fi technology. These speeds offer a lot of potential for wireless connectivity.
- B. We may not know that light already is the most popular means to transmit data across long distances. Fibre optic cables are used to send data as light through tiny strands of silicon. Fibre optics are referred as the arteries of much of the modern internet, allowing fast transmissions of data around the world. Li-Fi uses light just as fibre optics do to transmit the information, but instead of maintaining it through the thin strand of fibre, it allows the light to spread out in all directions so devices all over the room can connect.
- C. This may be a just few years to go to see this technology in our homes, the potential is impressive. Even in laboratory testing this new Li-Fi technology is showing great promise performance and speeds way beyond what Wi-Fi used to handle in any real-world environment.

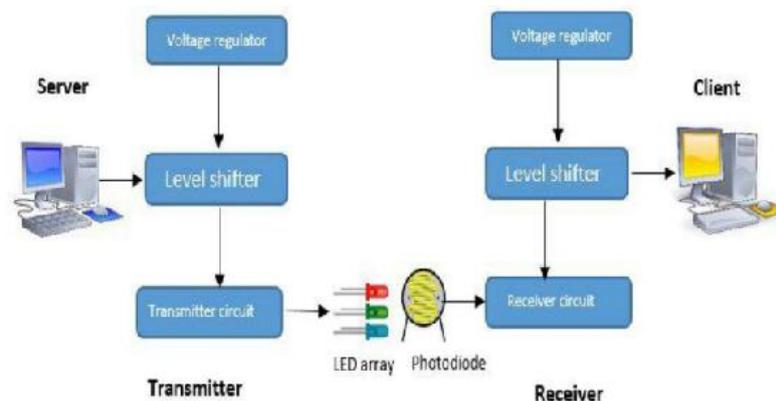


Fig. 1: Construction of Li- Fi system

III. LIGHT BULBS COULD REPLACE YOUR WI-FI ROUTER

There are around 1.4 million cellular radio waves base stations deployed, with over 5 billion mobile phones. mobile phones transmit over 600tb of data. Presently wireless communication uses radio waves. SPECTRUM is the one of the most essential requirement for wireless communication. with the advancement in the technology and the number of users the existing radio waves spectrum fails to this need the capacity of the radio waves are expensive, bandwidth, insufficient spectrum availability of this spectrum is limited these radio waves are not available in aircraft or in hospitals. They are congested due to the high uses of 2g 3g and 4g the base station used are only 5% efficient. 95% of efficiency is used in base station. The security also suffers. The Wi-Fi is penetrable through the wall the security is the big issue here. One can hack the password. An unauthorized person can access

the private matter it is less economic. Availability of radio waves are less hence traffic rates are high. Due to this it is highly expensive. Moreover, radio wave cannot pass under sea. These drawbacks give rise to find new inventions a new method of communication that is visible light communication. This technology is yet to be in the market i.e. based on data communication through light. We got these ideas from daily life gadgets that are our own phone which gives us the inspiration to use a keypad similar to the phone which will help us in transferring numeric data through light. Picking up the daily usable thing and using it to transfer data has been our inspiration. We tried to make it flexible, portable and a self-sustaining project. These projects cannot only work on a white LED light which can be connected to it hence make it a more environmentally friendly project which can work under any light [11-15].

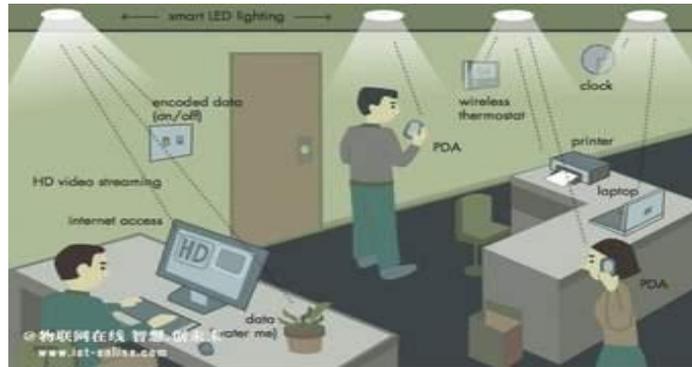


Fig. 2: LED bulbs enabling all the electronics devices to run Internet, Li-Fi (Light Fidelity)- The Future Technology in Wireless

IV. HISTORY AND BACKGROUND

In 2012, Jyoti rani proposed that li-fi is defined as transmission of data through illumination [3]. Sending data through a LED light bulb that varies and intensity faster than the human eye can follow. Li-fi is a term some have used to label the fast and chip wireless communication system, which is optical version of Wi-Fi. The term was first used in this context by HARALD HAAS in his TED global talk on visible light communication. At the heart of this technology is a new generation of high brightness light emitting diodes. The LED intensity is modulated so rapidly that human eye cannot notice, so the output appears to be constant [18-21].

In 2013, JAYH, BHUT exploited that using a standard white light LED, researchers at the HENRICH HERTZ institute in Berlin, Germany, have researched data rate of over 500 megabyte per sec, using a pair of Casio samara phones the technology was demonstrated at the 2012 consumer electronics show in LAS VEGAS to exchange data using light of varying intensity given off from their screens, detectable at a distance up to 10 meters [4]. A consortium called Li-Fi consortium was formed in Oct 2011 by a group of companies and industry groups to promote high speed optical wireless system overcome the limited amount of radio based wireless spectrum. According to the Li-Fi consortium, it is possible to achieve more than 10 gbps of speed, theoretically which would allow a high definition film to be downloaded in 30 seconds [22-23].

In 2014 (March), WITTHAL S. SAPTASGARE put forward that seamless all optical wireless network would require ubiquitous coverage provided by the optical front end elements these necessitate the usage of the large amount of li-fi enabled lighting units. The most likely candidate for front end devices in VLC is in coherent solid state lighting LEDs due to their low cost. Due to the physical properties of these components, information can only be encoded in the intensity of the emitted light, while the actual phase and the amplitude of the light wave cannot be modulated. This significantly differentiates VLC from RF communication [24].

In 2015, SHUBHAM CHATTERJEE proposed that Li-Fi is a technology which uses white light i.e. visible light from communication instead of radio frequencies or radio waves it refers to the 5G VLC systems using LED that in similar manner as Wi-Fi this will help to conserve a large amount of electricity it can be used in aircrafts, it also cannot penetrate through walls [25].

In March 2015, R KARTIKA exploited the efficiency, durability and life time of the LEDs which leads to the use in various applications [21- 25].

V. PROBLEM FORMULATION

To resolve the issue of scalability, availability and security which was occurred in Wi-Fi technology, we have come up with the concept of transmitting data wireless through light using LED which is called as li-fi is the latest technology that made use of LED lights which help in the transmission of data much faster and flexible than data that can be transmitted through Wi-Fi. LED lights are becoming widely used for home and offices for their luminance efficiency. Visible light communication (VLC) is a new way of wireless communication using visible

light LEDs and receiver are photo diodes and an image sense SOR. We present a new application which will be made possible by visual light communication technology. Location based service are considered to be especially sustainable for visual light communication application. An indoor visual data transmission system utilizing LEDs is proposed [16- 17]. In this system these devices are used not only for illuminating room but also for an optical wireless communication system. Figure 1 shows the block diagram of Li- Fi system.

VI. RESULT AND DISCUSSION

To overcome the limitation of radio base wireless network spectrum which is limited in amount it is aimed at communication tools which present in public places which can come up with high rate of data transfer over wide spectrum and also to control household appliances i.e. home automation using Li-Fi. As light is everywhere and free to use, there is a great scope for the use and evolution of Li-Fi technology. If this technology becomes mature, each Li-Fi bulb can be used to transmit wireless data. As the Li-Fi technology becomes popular, it will lead to a cleaner, greener, safer communications and have a bright future and environment. The concept of Li-Fi is deriving many people as it is free (require no license) and faster means of data transfer. If it evolves faster, people will use this technology more and more.

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