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Praxis of Light Fidelity (LI-FI) and their Applications in Digital Library System: a Conclusive Approach

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Abstract

The prime objective of communication is the exchange of information.Due to the advent of nascent technology, we can easily explore new ideas and notions, these ideas have been implemented in different system design and format. Li- Fi serves as an alternative to WI- Fi in term of less expensive and more traffic handling capacity. Simple we can say that it is a new technique of transferring secured data using lights. Li-Fi provides transmission of data through illumination by sending data through an LED light bulb..Day-to-day routine, one of the most important activities in libraries is the transfer of data from one place to another and search information on the internet. In this article, author's tried to find out and exhorted the feasibility and applications of LI-Fi in digital library system.

Keywords: Li-Fi Transmission,Wi-Fi, RFID Tags, Light-emitted diode (LED)

CONCEPTUAL FRAMEWORK:

In library user come and want their needed information get soon, but everything is not available in print form so the user needs internet to search their required information. If users want to store and download all of our files, including documents, articles, scholarly work, movies, music, and pictures in a few seconds, the more they will need high bandwidth and tremendous speed. The use of the visible light spectrum for high speed data communication is enabled by the emergence of the light emitting diode (LED) which at the same time is at the heart of the next wave of energy-efficient illumination. Li-Fi is a wireless optical networking technology that uses light-emitting diodes (LEDs) for data transmission. Li-Fi is designed to use LED light bulbs similar to those currently in use in many energy-conscious homes and offices.

However, Li-Fi bulbs are outfitted with a chip that modulates the light imperceptibly for optical data transmission. Li-Fi data is transmitted by the LED bulbs and received by photo receptor.(Suganya & Subhalakshmipriya, 2015). Light Fidelity (Li-Fi) is the latest 5G technology in wireless communication. It is currently becoming more popular as it overcomes the demerits of Wi-Fi and is more energy-efficient. The Wi-Fi radio frequency range is insufficient as the number of users is increasing day by day. To meet this growing demand, the visible light frequency band is used in Li-fi. It makes use of LED (Light Emitting Diode) lights in order to transmit data at a much faster rate than through Wi-Fi that means, it uses visible light, instead of radio waves, from the electromagnetic spectrum and hence it is termed as visible light communication (VLC). VLC uses rapid pulses of light, which cannot be detected by the human eye, to transmit information. So it is very important technology for researchers and library users to save their time and download anything in a nanosecond through wireless communication as a form of Li-Fi. Li-Fi is similar to Wi-Fi. Unlike Wi-Fi, which uses radio waves as transferring medium, here we use visible light as the medium to transfer data. The most important problem in Wi-Fi is the security and data breaching in case of high secured data transfer there are various limitations like, one to one communication or need one authorized person to validate the secured data and is time consuming (Gowthami, 2017). Imagine a world where every one of the billions of light bulbs in use today is a wireless hotspot delivering connectivity at speeds that can only be dreamed of with Li-Fi.

FEASIBILITY OF LI-FI TECHNOLOGY IN 21TH ERA:

A new era in wireless communication is soon going to hit the world that is Li-Fi technology which means light fidelity. This technology was proposed by Prof. Harald Hass, a German scientist, along with his team, including Dr. Gorden Povey, Dr. Mostafa Afgani at the University of Edinburgh. Hass, who discovered a method to transfer data through illumination which he called it as D-light (or LI-FI). LI-FI which is a very advanced version of WI-FI is, basically light fidelity which uses visible light communication instead of radio wave communication as in WI-FI. As speed of light is way faster than radio waves hence it can be used with a speed of around 250 times more than any high speed broadband (Sowbhagya & et al., 2016). “The scientist Harald Hass referred this technology as “Data through illumination”. As compared to general broadband connection, this technology provides higher data speed than 10 Mbps which is much faster. Li-Fi is an OWC (Optical Wireless Communication) system which uses light from LED (light Emitting Diode), acts as a medium to deliver networked, and mobile, high-speed communication similar to Wi-Fi. Both Wi-Fi and Li-Fi transmits the data over the electromagnetic spectrum only difference is that Wi-Fi utilizes radio waves whereas Li-Fi utilizes visible light. As the velocity of light is much large, hence due to this the rate of data transmission is more as compared to Wi-Fi which uses radio waves for data transmission (Shrivas, 2015).

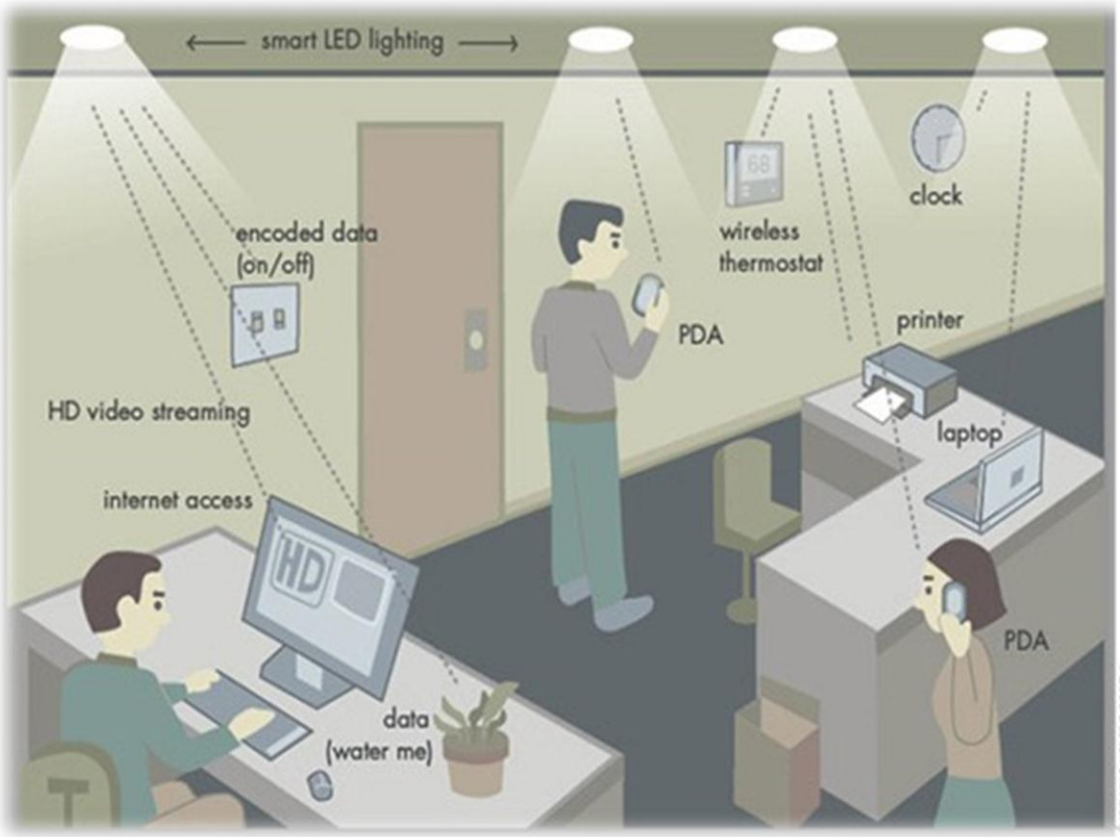
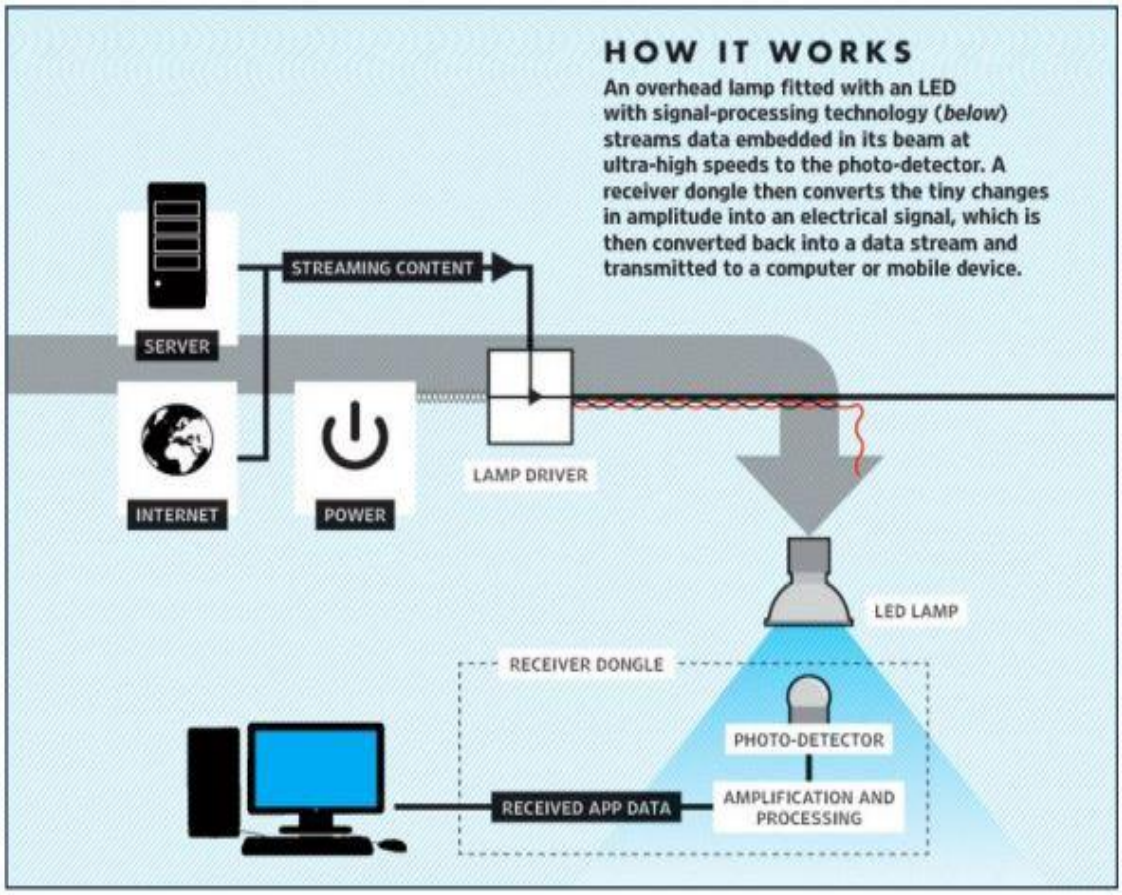


Diagram of Smart Li-Fi technology effect on various devices

(Source:http://ijariie.com/AdminUploadPdf/Review_Paper_on_Li_Fi__Light_Fidelity__ijariie2056.pdf)

EFFICACY OF LI-FI TECHNOLOGY IN DIFFERENT AREA:

Keeping in the view of Li-Fi and its applications, it is better use for including directional lighting, energy efficiency, intrinsic security, high data rate capability, signal blocking by walls and integrated networking capability. Each artificial light source in the application environment becomes a separate data channel. These channels can supply different data into each separate pool of light, delivered at the full rated download speed for that channel (Shrivastava, 2016). Li-Fi can be used indoors for high density, more security, free unlicensed spectrums with a high level of radiofrequency (RF) noise and interference in the environment, such as, casinos, malls and coffee shops.



Li-Fi can be used in hospitals, particularly for new medical instruments, as Li-Fi is noise and interference free. Light sources are installed in aircraft cabinets in abundance; therefore, Li-Fi can be used for smarter aircrafts, where this technology will never affect or interfere with the navigational system of the aircraft. Li-Fi works perfectly well underwater unlike Wi-Fi. Therefore, it is possible to use it in underwater remote operations vehicle for rescues and exploring. As a pair, Li-Fi can be used for military operations in the underwater world.(Yuvaraj, 2016).

MAJOR PITFALL OF LI-FI TECHNOLOGY:

Despite its many advantages, Li-Fi like any other technology also comes with a number of limitations and disadvantages. These are enumerated below:

1) The main problem is that light cannot pass through objects, so if the receiver is inadvertently blocked in any way, then the signal will immediately be cut out. If the light signal is blocked one could switch back over to radio waves.

2) High installation cost of the systems can be complemented by large-scale implementation of VLC though adopting this technology will reduce further operating costs like electricity charges, maintenance charges etc(Sowbhagya & Al., 2016).

3) The services of Li-Fi can be availed only in the presence of direct light source since visible light acts as a data carrier here.

4) Light coming from other sources other than the intended light source will disrupt the signal. This is one of the major drawbacks. Even sun rays coming from outside will affect the communication (Chakraborty & et al., 2017).

5) One of the major disadvantages is that the artificial light cannot penetrate into the wall and other opaque materials which radio waves can do. Hence, we cannot transfer the data from one enclosed room to another one. Li-Fi is not able in the works in direct line of sight(Shrivas, 2015).

APPLICATIONS OF LI-FI IN DIGITAL LIBRARY SYSTEM ENVIRONMENT:

In the digital library we have seen that collection of data that are globally available through network computer, but sometimes books are mangled in a library and not properly arranged in a systematic manner. If we use Li-Fi technology in the libraries, then all the work will be easy and fast because the speed of Li-Fi is relatively hundred times faster than the standard Wi-Fi download speeds. Li-Fi works by trapping the intensity of light for communication and the light is diffused so fast that it is not noticed by the human eye. Keeping in the view of Li-Fi technology, books can be assigned with a transceiver of LI-Fi which is operated by the phone and gives all the details of the book such as price, ISBN, author name, place, publisher. The user just has to stand near the section of the book and type the book name, the book transceiver will automatically give details of the respective book.This blatant method can also used to track some misplaced books in a library and reduced time and manpower. Some other LI-Fi applications are high data capability, energy efficiency, intrinsic security, integrated network capability, Disaster management, Traffic management. Apart from that Li-Fi can be used for smart library building in future and ERNET india has initiated Li-Fi pilot project and explore development of open source general purpose platform.

Li-Fi has awesome potential in case of circulation desk. LED light bulb will able to scan particular details through binary codes instead of RFID tags. Li-Fi technology can be used such that instead of going into the seminar halls for parents meeting and other purposes, the information will be directly sent by use of Li-Fi technology to the parents or the particular person.(Shah & et al., 2017). Li-Fi technology that it will be accessible to the common citizens in near future. It will be beneficial to most of the research works, underwater/underground research and communication, medical science and even in military sectors for its aid in secured communication. A great change in daily life on every aspect will happen if Li-Fi technology replaces Wi-Fi and other broad band networks.(Chakraborty & et al., 2017).

CONCLUDING REMARKS:

No doubt smartphones and data centers will be the most damaging information and communications technologies for the environment, but we are availing with the recent development of information technology and used in our system. We are advancing in technology and adapting to a new life style. Li-Fi is the best option and we should replace with Wi-Fi technology. RFID system is to carry data in suitable transponders, generally known as tags and to retrieve data, by machine readable means, at a suitable time and place and to satisfy particular application needs. Li-Fi is rapidly emerging as a powerful wireless networking and it will be help in tracking of books in stock verification process. Technology world we admitted that there are so many technical hitches, but we tried to explore the new ontology based system and theory. In concluding remarks we should not be dejected and believe the theory of the survival of the fittest.

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