

LIGHT FIDELITY: - AN INTERNET COMMUNICATION SYSTEM FROM FUTURE

Mrs.B.Annapurna

HOD, Department of Computer Science
CH.S.D.ST.Theresa's College for Women, Eluru, India
annapurnagandrey@gmail.com

Mrs.V.Sravanthi

Assistant Professor, , Department of Computer Science
CH.S.D.ST.Theresa's College for Women, Eluru, India
svsravanthi6@gmail.com

Mrs.A.Mamatha

Assistant Professor, , Department of Computer Science
CH.S.D.ST.Theresa's College for Women, Eluru, India
Mamathasree15@gmail.com

Mrs.K.L.L.Lavanya

Assistant Professor, , Department of Computer Science
CH.S.D.ST.Theresa's College for Women, Eluru, India
lavanya.bh87@gmail.com

ABSTRACT

In Current era major areas unit web to accomplish their task through wired or wireless network. As number of users get enhanced day by day and the wireless communication speed gradually decreases proportionately. Although Wi-Fi provides speed up to 150 MBPS as per IEEE 802.11N, it's still insufficient to accommodate no of users. To remedy this limitation of Wireless Fidelity, we have an introducing idea of Li-Fi (Light Fidelity). Light-Fidelity could be a label for wireless-communication systems using light as a carrier rather than ancient radio Frequencies, as in Wi-Fi. Li-Fi has the advantage of having the ability to be employed in sensitive areas like in aircraft and alternative transportation while not inflicting interference. However, the sunshine waves used cannot penetrate walls. It's generally enforced using white junction rectifier bulbs at the Downlink transmitter. This sort of devices square measure usually used for illumination solely by applying a relentless current. However, by quick and refined variations of this, the optical output will be created to vary at very high speeds of 10 Gbps.

Keywords: LED, IEEE 802.11N, Li-Fi (Light Fidelity)

1. Introduction

This property of optical current is employed in Li-Fi setup. The operational procedure is incredibly simple-, if the junction rectifier bulb is on, you transmit a digital one, if it's off you transmit a zero. The LEDs will be switched on and off terribly quickly, which supplies nice opportunities for sending data. Thus all that's needed is a few LEDs and a controller that code knowledge into those LEDs. All one needs to do is to vary the speed at that the LED's flicker relying upon the info we would like to cipher. Any enhancements will be created during this technique, like using Associate in Nursing array of LEDs for parallel knowledge transmission, or deploying mixtures of red, inexperienced and blue LEDs to change the light's frequency with every frequency encryption a unique knowledge Channel. Such advancements promise a theoretical speed of 10 Gbps – which means one will transfer a full high-definition film in exactly thirty seconds. Li-Fi and Wi-Fi square measure quite similar as each transmit data electromagnetically. However, Wi-Fi

uses radio waves, whereas Li-Fi runs on actinic ray waves. As we tend to currently understand, Li-Fi could be an Visible Light Communications (VLC) system. This implies that it accommodates a photo-detector to receive lightweight signals and a sign process component to convert the info into 'streamable' content. A light-emitting diode lightweight bulb could be a semiconductor light that means that the constant current of electricity equipped to Associate in nursing light-emitting diode lightweight bulb is swayback and dim, up and down at extraordinarily high speeds, while not being visible to the human eye. For example, data is fed into Associate in Nursing light-emitting diode lightweight bulb (with signal process technology), it then sends knowledge (embedded in its beam) at speedy speeds to the photo-detector (photodiode). The tiny changes within the speedy dimming of light-emitting diode bulbs is then reborn by the 'receiver' into electrical signal.



Fig.1 – Light Fidelity: A futuristic internet data transmitter

2. PREVIOUS WORK

In 2011, Professor Harold Haas from the University of Edinburgh in the UK, suggested an idea called “Data through illumination” [4]. He used fiber optics to send data through LED light bulbs. Light modulation certainly is not a new concept, but Haas is looking to move things forward and enable connectivity through simple LED bulbs. With Li-Fi, we can connect to the internet simply by being within range of an LED beam, or we could conceivably transmit data using our car headlights.

The ramifications of this are huge, especially with the internet of things in full swing and the much mooted spectrum crunch expected to bite increasingly hard in the coming years. LI-FI is a new technology which uses visible light for communication instead of radio waves. It refers to 5G Visible Light Communication systems using Light Emitting Diodes as a medium to high-speed communication in a similar manner as WI-FI [6]. It can help to conserve a large amount of electricity by transmitting data through light bulbs and other such lighting equipment's. It can be used in aircrafts without causing any kind of interference. LI-FI uses light as a carrier as opposed to traditional use of radio waves as in WI-FI and this means that it cannot penetrate walls, which the radio waves are able to.

It is typically implemented using white LED bulbs at the downlink transmitter [1]. By varying the current through the LED at a very high speed, we can vary the output at very high speeds. This is the principle of the LI-FI. The working of the LI-FI is itself very simple—if the LED is ON, the signal transmitted is a digital 1 whereas if it is OFF, the signal transmitted is a digital 0. By varying the rate at which the LEDs flicker, we can encode various data and transmit it. Li-Fi is no longer a concept or an idea but a proven

technology, albeit still at its infancy. Already, several experts in the field of communication have attested that Li-Fi technology would soon become a standard adjunct to Wi-Fi. That is, until its inherent limitations could be overcome. Since it is light-based, its major drawback is that it won't be able to penetrate solid objects such as walls. Though it could also mean privacy for the personal user, it also questions its use for largescale delivery of data transmissions. But despite its drawbacks, researchers all over the world have been going all-out in further developing this new technology. A research was initiated by a consortium of universities that includes the Universities of Cambridge, Oxford, St. Andrews and Strathclyde in Scotland. It is led by Professors Martin Dawson, from the Institute of Photonics, and Harald Haas, from the University of Edinburgh. The goal of the consortium is to eventually make every illuminated device, such as televisions, lamps, road signs, and commercial ad boxes, transmit data to gadgets such as mobile phones.

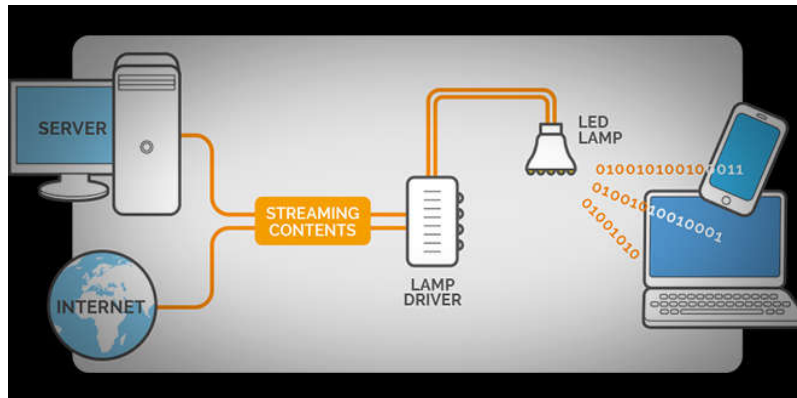


Fig.2 – Light Fidelity: Data Processing

At the University of Strathclyde, researchers have begun earnest efforts at bringing this new technology to market. Their biggest accomplishment to date is the development of LEDs that are a thousand times smaller than the smallest commercial LED. Dubbed micro-LED or micron-sized LEDs, these newer models are merely 1µm² (square micrometers) in size. This means that 1,000 more lights could be fit into the same space as a typical LED. In addition to its size, micro LEDs can flicker 1,000 times faster than commercial LED. Thus, in theory, a bank of 1,000 micro-LEDs flashing 1,000 times faster could transmit data a million times faster than that of an average LED. At the moment, the potential Advantage of micro-LEDs for Li-Fi use is staggering.

2.1 Li-Fi vs. Wi-Fi

	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

3. PROPOSED SYSTEM

3.1 Li-Fi Working Process

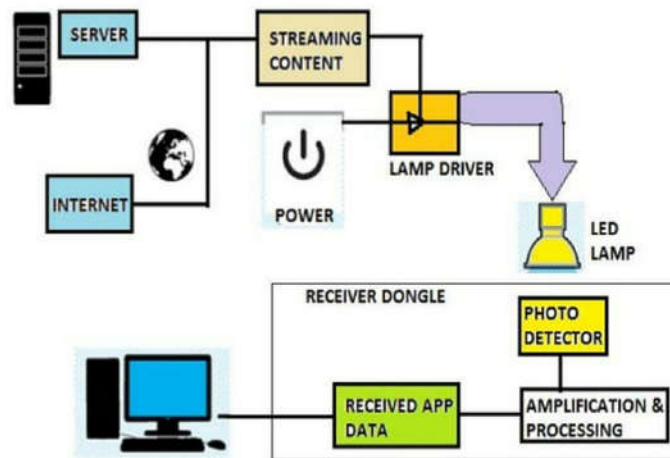


Fig.3 – Light Fidelity: Operation

Li-Fi and Wi-Fi are quite similar as each transmit knowledge electromagnetically. However, Wi-Fi uses radio waves whereas Li-Fi runs on visible radiation. As we tend to currently understand, Li-Fi could be a Visible Light Communications (VLC) system. This suggests that it accommodates a photo-detector to receive lightweight signals and a symptom process component to convert the information into 'stream-able' content. An light-emitting diode light bulb could be a semi-conductor source of illumination that means that the constant current of electricity provided to associate degree light-emitting diode light bulb is swayback and dimmed , up and down at very high speeds, while not being visible to the human eye. For example, knowledge is fed into associate degree light-emitting diode lightweight bulb (with signal process technology), it then sends knowledge (embedded in its beam) at fast speeds to the photo-detector (photodiode). The tiny changes within the fast dimming of light-emitting diode bulbs is then born-again by the 'receiver' into electrical signal. The signal is then born-again into a binary knowledge stream that we might recognize as internet, video and audio applications that run on web permits devices.

3.2 Advantages

1. Light Fidelity uses light-weight instead of frequency signals therefore area unit intolerant to disturbances.
2. VLC may be used safely in craft while not moving airlines signals.
3. Integrated into medical devices and in hospitals as this technology doesn't modify radio waves, therefore it will simply be utilized in all such places wherever Bluetooth, infrared, Wi-Fi and internet area unit loosely in use.
4. Underneath water in ocean Wi-Fi doesn't work about light will be used and therefore submarine explorations area unit sensible to travel currently with abundant ease. There area unit billions of bulbs worldwide that simply ought to get replaced with LED's to transmit data.
5. Security could be a facet advantage of using light for knowledge data because it doesn't penetrate through walls.
6. On highways for control applications like wherever Cars will have semiconductor diode primarily based headlights, semiconductor diode primarily based backlights, and that

they will communicate with one another and stop accidents. Using this Technology worldwide each streetlight would be a free knowledge access purpose.

7. The problems of the shortage of frequency information measure could also be sorted out by Li-Fi.

4. BLOCK DIAGRAM

4.1 Working Unit



Fig.4 – Working Unit Li-Fi

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Mrs. B .Annapurna MCA, M.Tech,(Ph.D.),is currently working as HOD in Department of Computer Science since 1996 , CH.S.D.ST.Theresa's college for women , Eluru , West Godavari district , A.P . Published many papers in national and international journals, resource person for various workshops, seminars and conferences.