Li Fi Technology: Trans receiver problems

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Abstract : The alternating technology used instead of radio frequency spectrum is visible light spectrum; this can be achieved by using LED. Li-Fi not only eliminates the problem of radio frequency congestion, but it also helps in transferring data in places where radio frequency communication cannot be used. This work demonstrates the Trans receiver drawbacks using serial communication. This paper focuses on a Li-Fi based system and analyzes its performance. A study on light communication was done and most efficient method has been used. Visible light communication system is more useful in the areas where the radiations and OFC are prohibited.

Keywords: Radio wave spectrum, Visible Light Spectrum, Li Fi Technology **- Component,**

I. INTRODUCTION

Light Fidelity (Li-Fi) is a data transfer technique that uses light. The objective of Li-Fi is used to transfer data through visible light. Since the bandwidth of visible light is 10,000 times more than Radio waves, more data can be transferred through light at short period of time. In present scenario the bandwidth capacity of radio frequency which is available is finite & is not capable enough to sustain with the constantly increasing demand of wireless data transfer size. Light is inherently safe and can be used in places where radio frequency communication is often deemed problematic, such as in aircraft, nuclear power plants or hospitals, without causing electromagnetic interference. The visible light spectrum is unused; it is not regulated, and can be used for communication at very high speed [1].

Li Fi Source

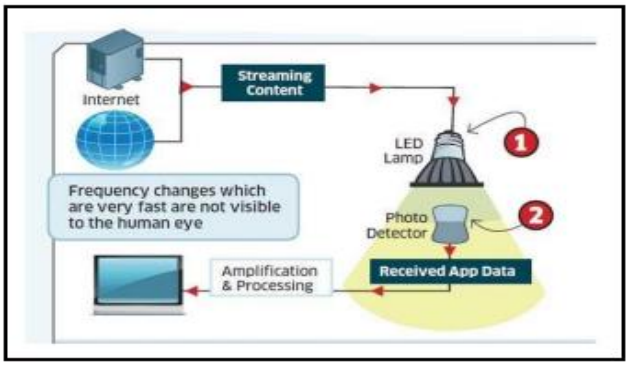
Li-Fi provides usage in many internet content consumption applications like audio and video downloads, live streaming etc. These applications demand larger downlink bandwidth, but they need minimum downlink requirement. In this way majority of internet traffic is offloaded from existing radio frequency communication to the visible light communication.

This helps in decongestion of radio frequency spectrum thereby extending cellular and Wi-Fi capacities [2].

Li-Fi was introduced in 2011 by Harald Haas who was a germen physicist. Li-Fi technology throughout the optic fiber by sending the data through Light Emitting Diodes, which can perform a transmission of 10 megabits per second [5].

Li Fi System

The excess radio frequency spectrum demands of cellular networks and Wi-Fi can be met by using Li-Fi. Besides on this Visible light spectrum is unregulated and vast. Li Fi can even work under water were Wi Fi fails completely, thereby throwing open endless opportunities for military / navigation operations. Since airways communication is mainly based on the radio communication, to overcome this problems Li Fi technology is introduced. So Li-Fi to only solve the problem of radio frequency congestion, but it also is very cheap as compared to radio frequency communication. Li-Fi has incredible data rates that can be put into use as a solution in many real time applications. In this work, a LASER source is used as the light source or transmitter and photodiode as a receiver in the circuits. From the data obtained an analysis is made.

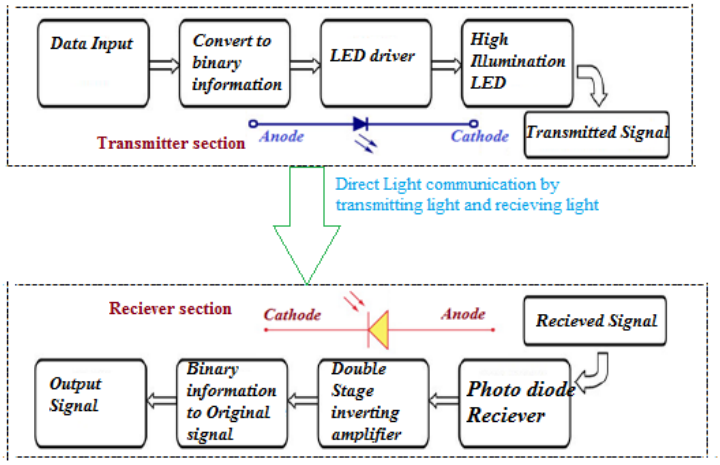


II. WORKING

LED bulbs are increasing day by day. These LED bulbs can not only be used as a light source, but they can also be put to use as a Li-Fi hotspot [6]. Li-Fi is typically implemented using white LED light bulbs at the downlink transmitter. LED's are normally used for illumination only by applying a constant current. However, by rapid and continuous variations of the current, its output can be flickered at very high speeds. This very property of LED's is used in Li-Fi setup. The basic principle of operation is very simple, if the LED is on, you transmit a digital '1', if it's off you transmit a '0'. LED and photodiode are the major components of Li-Fi circuitry.

The logic behind the working of light fidelity technology is much unmingled. If the LED is on, a digital string '1′ is transmitted and when the LED is off then a digital string '0′ is transmitted. For example, there is a LED at one end and a photo detector at the other end, whenever the LED is on, a binary '1′ and when the LED is off a binary '0′ is registered by the photo detector. Thus, a message is built up by many flashes of LED.

Many other highly developed technologies can be used for increasing the data rate of VLC, recent research in Berlin attained rates of 500 megabytes per second. Parallel data transmission where each LED generates a separate data stream and has been focusing on many teams in the University of Oxford and Edinburg. Li-Fi uses visible light as a communication medium with frequency between 400THz to 800THz to wavelength of between 780nm to 375nm. Li-fi uses two main section, transmitter and receiver, for reliable data transfer. Both transmitter and receiver use semiconductor diode, light emitting diode and light sensor/detector diode respectively.



Transmitter: White LED light bulbs are used to transmit the information as well as fulfilling the purpose of illumination. Through fast and slight variations of the current (which is applied to the LED), the optical output can be made to vary at very high speeds. The variation caused in the current which is passed to the LED will carry data at high speed and cannot be seen by the human eye. Thus, encoding of data by changing the rate of flickering of LED is the basic principle of Li-Fi transmitter [7]. This condition is controlled with the help of driver circuit.

Receiver section: A photo diode is used as a receiver to receive the light intensity variation, which causes variation in the current in receiver circuit. This weak received signal is the amplified and the converted to binary signal of ones and zeros. Finally, this converted zeros and one's stream data is read by the receiver computer or device.

III. RESULTS AND DISCUSSION

From the study the following observation are made for Trans receiver problems. To build data conversion model one should know the suitable microcontroller and conversion circuit for these purposes. The main problems are light spectrum. Because the light cannot pass through solid object medium and building materials the range is very limited. The cost of visual light communication is very high when compared with Blue- tooth and Wi-Fi systems. If the object is moving then it is very difficult to receive data i.e. network coverage is the major issues and obstacles any area in which light not directly falls.

The management of thermal temperature is a critical design issue of high-power LEDs. High junction temperature can affect spectral efficiency. Junction temperature of LED can be increase due to variation in drive current, self-heating and ambient temperature. This high junction temperature could cause degradation in power of a single with respect to time which reduces the signal to noise ratio (SNR) and degrades the lifespan of LEDs [3]. The effect could cause serious problems if array of hundreds of LEDs is connected closer to each other in a lighting system at large scale.

The lack of Bi directional communication is one of the major problems in the Li Fi technics. Li-Fi receivers can consist of an optical photo detector or an imaging sensor for receiving the beam of light. The photodiode is more beneficial for stationary users because in this case receive FOV and less energy efficient. Also produce delays in data reception as a result can decrease the overall achievable data rate. Therefore, it is challenging to design such an optical receiver that can control FOV misalignment.

A Wireless communication network is incomplete without the facility of uplink communication. In Li-Fi uplink requires that transmitter and receiver maintain a directional link during transmission. It can significantly reduce the overall throughput of the network if both devices are constantly moving. So, in Li-Fi it is also a challenge that how the uplink traffic in a network will be operate. The radio frequency and infrared can be considered for transmitting uplink data in Li-Fi network but still more innovative ideas are required for solving the uplink issues in Li-Fi networks.

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