

LI-FI Technology for Data Transmission through LED

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Abstract— The LI-FI is the newest technology in the Field of wireless communication. Nowadays many people are using internet to fulfill their task through wired or wireless. As the number of users is increases the rate of data transmission in the wireless network gets automatically decreases. WI-FI provides us speed near about 150mbps as per IEEE 802.11n but steel it is not able to fulfill the requirement of the user because of such reason we are introducing the LI-FI. According to the German phycist Harald Haas LI-FI provides more speed (10megabits per second) data transmission by using visible light. So here in this condition we are analyze the LI-FI/WI-FI.It's the same idea band behind infrared remote controls but far more powerful. Haas says his invention, which he calls D-LIGHT, can produce data rates faster than our average broadband connection. In this we are going to compare and analyzed the speed of LI-FI and WI-FI and also network jamming problem during the increase the increasing of users.

Index Terms—Wireless-Fidelity (Wi-Fi), Light-Fidelity (Li-Fi), Light Emitting Diode (LED), Visible light communication (VLC).

I. INTRODUCTION

Consider the present day it is very important that the speed of the data transmission is very important in order to execute the user's task within a time. If it is not possible due to any kind of reason then it will waste the user's time and also the money.so the speed is very important factor in the communication system whether it is wire or wireless data transmission system. Due to the speed any task can get execute within a second. Thus it becomes compulsory for wire and wireless transmission system to have a sufficient speed and also not get slow when the number of user's gets increases [1][6][7].

The Modern day Digital signal processing system (DSP) and Moduling system seems to provide us enough confidence to solve the present problem

and they can create and generate,[3][4] by using which we can grab and get the information related to the speed and type of data[2][5]. The increasing number of multi-media mobile devices and the extensive use of data-demanding mobile applications mean that current mobile networks are at their maximum capacity due to the limited availability of the radio frequency (RF) spectrum.Li-Fi Comprises a wide range of frequencies and wavelengths, from the infrared through visible and down to the ultraviolet spectrum It include sub-gigabit and Gigabit -class communication speeds for short, medium and long ranges, and unidirectional and bidirectional Data transfer using line-of-sight or diffuse links, reflections and much more[1]. This brilliant idea was first Showcased by Harald Haas from University of Edinburgh, UK, in his TED Global talk on VLC.In simple terms, Li-Fi can be thought of as a light-based Wi-Fi. That is, it uses light instead of radio waves to transmit information .

Wireless network plays a vital role in today's word the WI-FI covers the 100 to 500 feet area and the as per the intensity of light so both have their feathers. In the WI-FI WAP, WAP2 security is available where in the LI-FI have securities that it cannot go outside the wall.[1][3][21][22]

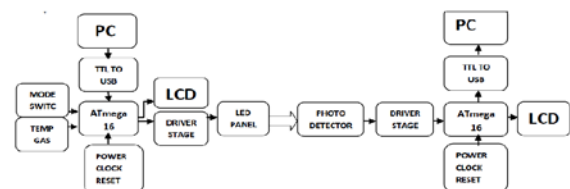


Figure 1.1: Block diagram of LI-FI

1.1 Transmitter of LI-FI

Fig. shows the LI-FI block diagram. The proposed plan of action for our project is to establish an optical wireless communication model that gives high data rates (in the order of MHz) and transmission distances of up to 1m. This model should effectively be able to transmit data from one

device to another using LED's, thereby establishing a LI-FI network in a localized environment. The system block diagram to be used for this project is shown in Fig.1.1. The system architecture consists of a transmit section and a receive section. The transmit section consists of the data input which is then fed into a switching control system. Based on the data, the switching control generates a stream of 1s and 0s thereby encoding the data in binary.

The output of this control is given to the array of LED's which turn OFF and ON at extremely high speeds. This ON-OFF modulation of the LED light transmits the data. LED is the choice for light source since it consumes very less power when compared to unresent lamp or a light bulb. It consumes about one-tenth the power when compared to conventional methods of lighting. Also, the lifetime of a typical LED bulb is several tens of thousands of hours. LED's are also fast switching with good visibility[13]. Thus, LED's are ideal for use as the down link transmitter. For the uplink transmitters, Infrared (IR) can be chosen to be the uplink transmitter for user convenience. This avoids fitting an LED light source on or next to the mobile devices[11].

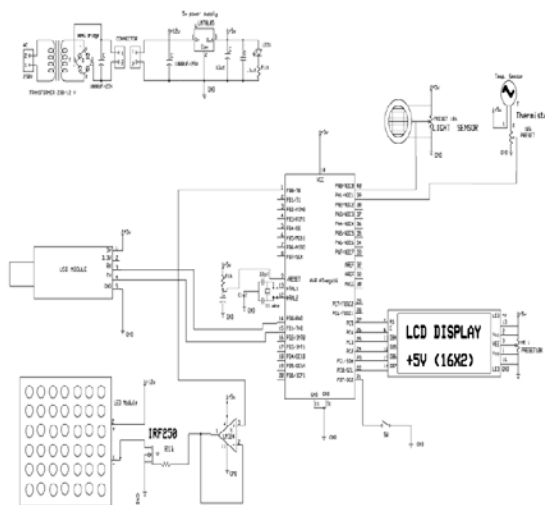


Figure 1.2: Circuit of Transmitter

1.2 Receiver of LI-FI

The receive section consists of a photodiode, e.g. silicon photo detector or an Infrared germanium cylindrical detector. The photo detector demodulates the incoming received signal based on the sequence of 1s and 0s. The demodulated signal is then sent to a filter to remove unwanted noise. This filtered signal is then amplified using signal amplification mechanism. The filtered and amplified signal is then given to an output device such as an LCD display or a speaker. The input signal is thus remotely transmitted and received. Thus, a Li-Fi network is established.

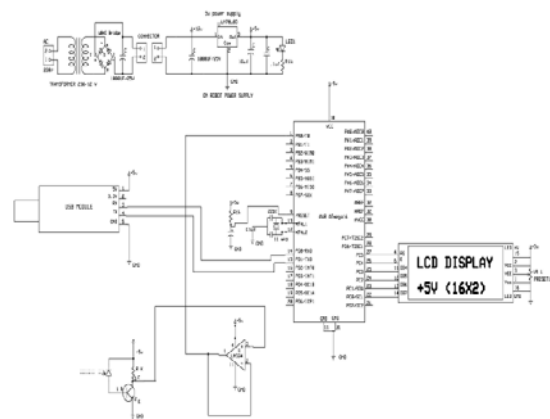
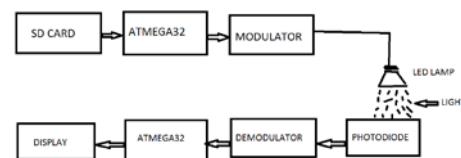


Figure 1.3: Circuit of receiver

II. LI-FI MODEL

2.1 LI-FI MODEL



2.2 Description

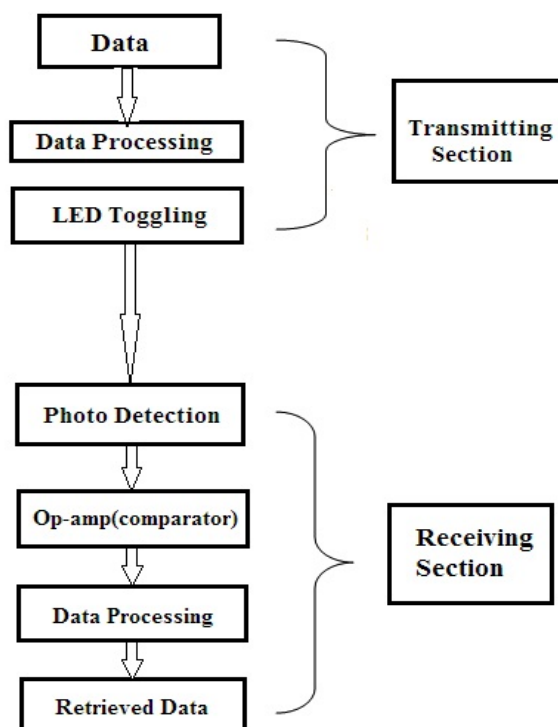
The LI-FI technology uses the light as their carrier medium for transmitting the data so that the space requirement is less. The System is controlled with Micro-controller that

Has been implemented using a AVR ATmega16 and thus reducing the time wasted by the system. In this presented prototype, LI-FI brings the data transfer rate to a great extent. It also consists of a LED and also we can use unresent light which also good but in this the speed of transmitting rate becomes slower which is its drawbacks .This LI-FI in 2011 was developed in the consideration of WI-FI so the name is LI-FI only in this system used visible light instead of radio frequency. In order to compare the speed both the tech and to overcome with the jam of network let us consider that a Li-Fi/Wi-Fi hybrid down-link system model is considered. This hybrid network covers an indoor area by NC Li-Fi Aps And a single Wi-Fi AP.In the scenario, users are uniformly distributed and move randomly. All of the APs are connected to a CU through error free inter-connection links.

Each Li-Fi AP is a large light emitting diode (LED) lamp which contains many low power LEDs, and each user has a photo detector (PD).It is assumed that all of the PDs are oriented perpendicular to the oar. This means that the angle of irradiation is equal to the angle of incidence. The field of view (FoV) of the LEDs and PDs can be designed so that the

transmission can be contained within a certain space. Also, the walls of a Room block light completely which means that there is no co-channel interference between rooms. Thus, each Li-Fi AP in this model covers a confined area, regarded as an attocell. In each attocell, the Li-Fi APs use the same modulation bandwidth. Users that reside in the overlapping area of Li-Fi attocells and are served by the Li-Fi APs would experience co-channel interference (CCI), which is treated as additional noise in this study. The Wi-Fi AP is assumed to cover the entire indoor area. Each user is either connected to a Li-Fi AP or the Wi-Fi AP for downlink wireless communications.

2.3 Flowchart of LI-FI



III. WI-FI

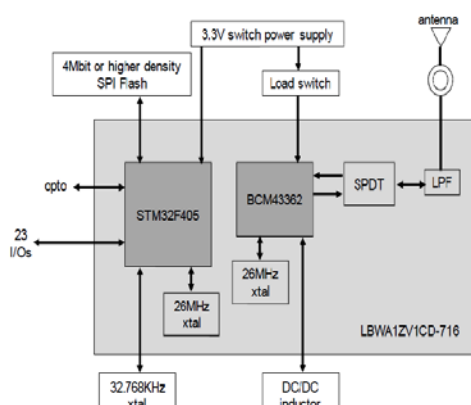


Figure 3.1: Block diagram of WI-FI

3.1 WI-FI

As shown in fig.3.1 WI-FI basically a used to transmit the data from one place to another place at a very high rate. Basically WI-FI travels a larger distance which is not possible for the LI-FI.802.11 technology has originated in 1985 by the U.S. Federal communications commission the ISM band for unlicensed use. In 1991 NCR Corporation/ATT invented a purpose to 802.11 in Nieuwegein; Netherland.The inventors initially intended to use the Technology for cashier systems. The first wireless products were brought to the market under the name Waveland with raw data rates of 1Mbits/s and 2Mbits/s.Vic Hayes, who held the chair of IEEE 802.11 for 10 years, has been called as Wi-Fi father.

3.5 Approaches of WI-FI

Its purpose is at creating large groups of stations that co-operate to share air- medium while minimizing energy consumption. It defines Wi-Fi system operating at 1GHz (approximately).Final approval may be on March 2016.It provides improved transmission range compared to conventional Wi-Fi due to its favorable propagation characteristics. Advanced applications include Large Scale Sensor networks, extended range hotspot.

Table 3.5: comparison

Parameters	WI-FI	LI-FI
Speed of data transfer	180Mbps	1Gbps
Medium of data transfer	Radio spectrum	Light source
Spectrum of range	Greater than 10000	Lesser than light
Cost	High	low
Network topology	Point to point	Point to point
Operating frequency	Hundreds of Tera Hz	2.4Ghz
security	Good	excellent

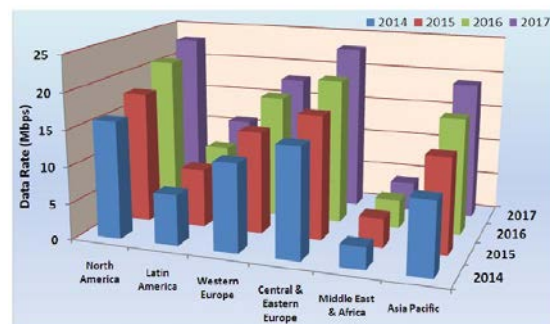


Figure 3.5: Expected Wi-Fi Network Connection Speeds by Global Regions from 2014-2016

IV. CONCLUSION

Here in this report we are going to sort out the problem like speed and jamming in WI-FI by using LI-FI technology. In this Report paper we conclude that the possibilities are numerous and can be explored further this technology is in manufacturing process to produce every bulb to become a Wi-Fi hotspot to transmit wireless data. In the WI-FI we come to know that the speed and the jamming are really take place which is today's problem because no. of users are increasing. But this jamming problem get reduces to a great extent by using LI-Fi and we will proceed towards the cleaner, greener, safer and brighter future without radio wave, because radio waves create a harmful effect for living thing, but Li-Fi is the optical wireless communication for data, audio and video streaming in LEDs, this type of new invention can be encouraged to produce a safe and green technology. Li-Fi will bring out Li-Fi products for firms installing LED-lighting systems. In future data for laptops, Smartphone's, and tablets can be transmitted through the light in a room by using LIFI.

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