An Approach towards High Speed Communication Using LIFI Technology

Aishwarya Hamand[1], Sunil Kuntawar[2]

[1](PG Scholar, Electronics and Telecommunication, Ballarpur Institute of technology, Ballarpur)
[2](Assistant Professor, Electronics and Telecommunication, Ballarpur Institute of technology, Ballarpur)
Corresponding Author: Aishwarya Hamand

Abstract : This paper presents an approach for High speed Wireless data communication through Li-Fi. Li-Fi as a new life of data communication is a better alternative for Wi-Fi. A German physicist, DR. Harald Haas defines this technology in 2011 TED Global Talk. , which is done by taking the fiber out of fiber optics by sending data through an LED light bulb that varies in intensity faster than the human eye can detect. Li-Fi is a special and a novel combination of technologies that permits it to be universally adopted for mobile extremely high speed internet communications
So our project basically we have designed a prototype Li-Fi system. We successfully achieved the output in the form of audio, data and b/w image. We create bride with IOT so we can access the LI-FI technology from anywhere.
Keywords : Li-Fi, VLC, TED, LED, IOT.

I. Introduction

Visible light communication (VLC) is a new way of wireless communication using visible light spectrum. Typical transmitters used for visible light communication are visible light LEDs and receivers are photodiodes and solar panels. Here we use the different software for transmission of text, audio, image and data. Using Terminal software we can transmits the text messages and using MATLAB we can transmits the images.

In our first experiment we are transmitting the analog audio signal via light signal. When the input is given to system which is in the form of audio amplifies the signal and drive through the LED which blinks continuously hence the data can transmitted through transmitter. In other side the receiver can receive the transmitted signal, this receiver consists solar panel which can detect the light source consisting of information. This information again converts to Inverter Amplifier and finally the original analog audio get from speaker. For the data transmission through Li- Fi we use USB to serial converter CP2102 at both ends which converts the signal for serial communication and the message goes to receiver side. In our next experiment an image is transferred through Li- Fi, for this we use a MATLAB GUI software in transmitter side, and LCD (128*64pixel), microcontroller 8051 are used in receiver side. First getting or browsing the image, resize it and convert into black and white image by bitmapping which is then send byte wise on comport. Li- Fi is researching technology, so in our research we have got a negative image in our LCD, in future we will try to get real picture. And for connectivity with IOT we have use a Wi-Fi module (Node MCU) and BLYNK mobile app. With this app we can operate relay connected to Li-Fi module, with this experiment we prove that Li-Fi can access from anywhere.

II. Literature Survey

- July 2011, at TED Global, there was a demonstration of the D-light project by Harald Haas, a professor at the University of Edinburgh. Haas promoted this technology in his 2011 TED Global talk and helped start a company to market it [1].
- In 2012, the paper published by Jyoti Rani and teammates was Li-Fi- The future technology in wireless communication. Through this paper it is understood that transmission is done by taking fibre out of fibre optics and data is sent through LED light [2].
- In 2014, Navyatha's group published the paper Li-Fi-Led based alternatives. Parallel data transmission is done by using any spectrum of light like red, green, blue [3].
- In APRIL 2014, the Russian company Stins Coman has announced the development of a Li-Fi wireless local network called Beam Caster. They achieved data rates of 1.25 GBPS.

- The authors designed 978-1-5090-4556-3/16/$31.00 ©2016 IEEE 2016 Online International Conference on Green Engineering and Technologies (IC-GET)the VLC system using blue LED and yellow LED where 400 Mbps data transmission rate was achieved [10].
- The research groups and centers that are taking part in build-up Li-Fi technology involve University of Oxford, University of Scotland, University of Edinburgh and University of California.

III. Result And Discussion

Light Fidelity is a branch of optical wireless communication which is an emerging technology. Light reaches nearly everywhere so communication can also go along with light easily. Here we see the method by which our project is done.

1. AUDIO TRANSMISSION

Let coming to the part of audio transmission, transmitter consisting the audio signal from the mobile phone as an input which connect through the audio jack and this audio signal will converted to analog signal through DAC. The analog signal is now converted light energy through transistor, this analog voltage change is used for flickering the LED at transmitter. At the receiver which consists solar panel which detects the LED information generates the waveform voltage which is then amplifies with speaker and we get the output audio signal on the speaker.
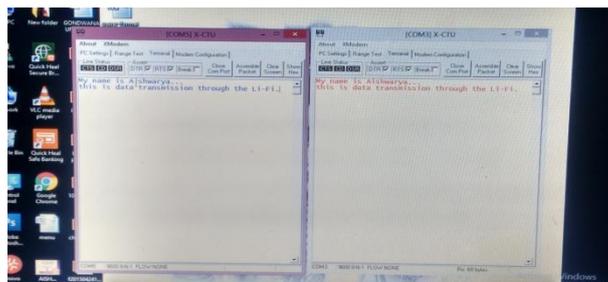
(1) Input audio signals and (2) Output received signals:-

| (1) | (2) |

2. DATA TRANSMISSION

Text messages also transmit between the two PC's in this we will use the Terminal Software (X-CTU). Here in the transmitter consists text as an input and by using Terminal Software the text what we are type that will be converted to ASCII information and by setting the baud rates range we can vary the transmission speed. This ASCII information will transmit through the LED. At the receiver the ASCII information will again convert to digital and display at the output terminal software. For the ASCII and data transmission through Li- Fi we use USB to serial converter CP2102 at both ends which converts the signal for serial communication and the message goes to receiver side. This way the pc input serially transmitted in the form of digital pulses and the voltage is switching between 0 to 5v. At the receiver side the threshold is set by comparator as 0 & 1 (digital), which is our output on another pc.

OUTPUT IMAGES-

3. IMAGE TRANSMISSION

In this experiment an image is transferred through Li- Fi, for this we use a MATLAB GUI software in transmitter side, and LCD (128*64pixel), microcontroller 8051 are used in receiver side. Here the MATLAB is used for transmission of images from PC to LCD. First getting or browsing the image, resize it and convert into black and white image by bitmapping which is then send byte wise on comport. At the receiver, the

microcontroller AT89S52 (8051) scans the signal and we get the b/w image on LCD screen which is connected to microcontroller. Li- Fi is researching technology, so in our research we have got a negative image in our LCD, in future we will try to get real picture.
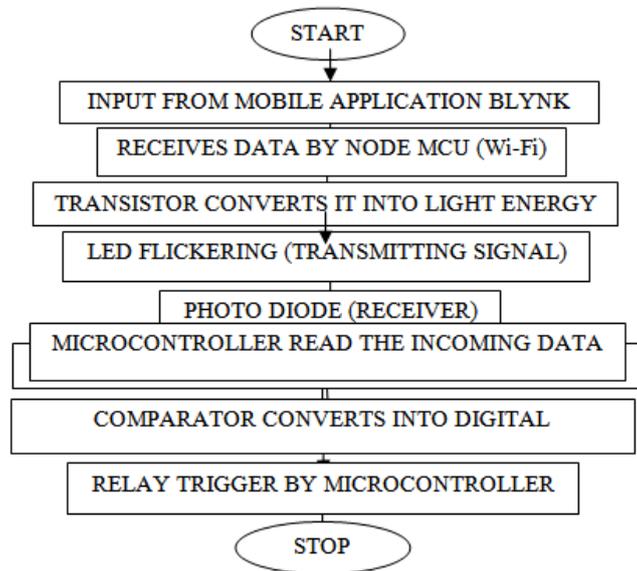
OUTPUT IMAGES-

4. CONNECTIVITY WITH IOT

Here we have used ESP8266 as a Wi-Fi module termed as Node MCU. In this Wi-Fi module, you can directly write code and program the ESP8266 module using Arduino language; this is connected to Cloud known as BLYNK. We have downloaded the BLYNK application in mobile so we can handle the Li-Fi module from anywhere. At transmitting side, we have mobile application from which we handle our base module. In our base module we used node MCU connected with Li-Fi dongle and LED, and at receiving side, pin diode used for getting the data which is then connected to 2 relays of 5v DC.Relay may loaded with some load like switch on or off the lights, fans etc. from office.
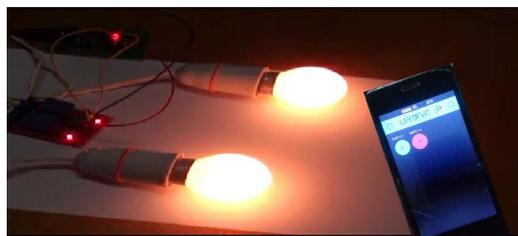
Flowchart-

OUTPUT IMAGES-

Fig. Result of Li-Fi with IOT

IV. Conclusion

Still there are some backdrops like it can only transmit when in the line of sight well but In future, data for laptops, smart phones & tablets can be transmitted through light in room by using Li- Fi. Researchers are developing micron sized LED which are able to flicker on & off around 1000 times quicker than larger LED. Through a wireless communication by using VLC we can transmits the data, audio, image and text message. Here in this paper reports the communication between the two PC's by implementing the Li- Fi communication. Li- Fi technology can be implemented to obtain high speed data transfer. Thus, this technology provides numerous benefits, by using this technology we can precede towards a greener, safer and cleaner future.

References

[1]. *Harald Haas. "Harald Haas: Wireless data from every light bulb". ted.com. Archived from the original on 8 June 2017.*
[2]. Jyoti Rani, Prerna Chauhan, Ritika Tripathi,"Li-Fi (Light Fidelity)-The future   technology In Wireless communication", International Journal of Applied Engineering Research, ISSN 0973-4562 Vol.7 No.11 (2012).
[3]. Y. Tanaka, S. Haruyama, and M. Nakagawa, "Wireless optical transmissions with white colored led for wireless home links," 11th IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC 2000), Vol. 2, London, U.K.,pp. 1325-1329, 2000.2016 Online International Conference on Green Engineering and Technologies (IC-GET)
[4]. https://www.scribd.com/doc/115111623/li-fi
[5]. https://en.wikipedia.org/wiki/Li-Fi
[6]. http://www.rfwireless-world.com/Terminology/LiFi-vs-WiFi.html
[7]. https://www.lifi.eng.ed.ac.uk/
[8]. https://www.irjet.net/archives/V3/i3/IRJET-V3I317.pdf.