International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 03 | Mar 2020 www.irjet.net p-ISSN: 2395-0072

VISIBLE LIGHT COMMUNICATION FOR VIDEO TRANSMISSION

I. Poonguhali[1], M. Anusha[2], V. Anciline[3], D. Kavitha[4]

[1]Asst. Professor, Department of ECE, Panimalar Institute of Technology, Tamil Nadu, India
[2,3,4]UG Scholar, Department of ECE, Panimalar Institute of Technology, Tamil Nadu, India

---

Abstract - *Wireless communication system having continuous growth like 3G,4G, etc., but there is a lack of Radio Frequency (RF) bandwidth, which can't support the continuous improvement for the large data rates and the large amount of communication systems. Instead of RF spectrum we can use light spectrum. Li-Fi is the technology which works under the light spectrum, it transmits data like text, audio through LED. Depending on the flash property of LED we can transmit the data, compare to Wi-Fi, Li-Fi has more advantages like high efficiency, security, bandwidth, speed, low latency, etc., Transmission is executed by switching LED light ON and OFF at a rate higher than the human eye can visible. This abstraction undertaking solves problems like bandwidth shortage and overcome the disadvantage of Wi-Fi. Li-Fi is the approaching and already innovated technology, therefore the upcoming demand of the Li-Fi can be found and expanded to various objectives and different advances of human life.*

Key Words: **Li-Fi, Light communication, Bandwidth, Radiation.**

1. INTRODUCTION

The next generation of wireless network targets very low latency, high data rate and more capacity [1]. Li-Fi uses the visible light segment of the light spectrum to transmit information at very high speed. Visible Light Communication (VLC) can provide high rate of transmission. Here wavelength division multiplexing is used to modulate the wavelength in the visible light spectrum. Light Emitting Diode (LED) is chosen as light source, this light source used for VLC high data rate communication [2]. LED technology for solid state light is progressed in R and D is gaining constant communication via visible light [3].

Using LED, to transmit the high quality of video and audio signal with the help of visible light communication, in the transmitter, the analog video signal was modulated to 15MHz Pulse Width Modulation (PWM). In receiver, a photodiode senses the optical signal transmitted from LED transmitter and converts it as analog signal. This is based on digital transmission of visible light form LED; the video and audio signal transmission are performed [4].

Video streaming of live it increasing popularity from mobile devices such as Instagram stories, snapshot, etc., pressurizes the network to increase the capacity of the network. As QoE is strong in user's Quality Experience, the source is proposing innovative solution to enable QoE when delivering video content through the wireless network [5]. In Li-Fi the data is received by a photodetector by modulating the energy of light. This modulation is not visible to human eye.

2. RELATED WORKS

The measurement-based channel pretends are used to perform the consequences challenge of Li-Fi network on indoor environment, while the theoretical channel pretends used in existing research. The two layout of User Equipment (UE) and spatial modulation are assumed. The contrasting sides of the UE, PDS is revealed by initiating Multidirectional Receiver (MDR) layout, e.g. smartphone. Due to presence of random accessary direction and obstruction the standard layout demonstrates the poor performance. The specification layout of MDR defeat by above 10db at Bit Error Rate (BER) of 3.8×10^{-3}. The Orientation Based Random Waypoint (ORWP) mobility spurious is supplicate for the user recital with random direction and obstruction in the complete room is appraised for sitting and walking scheme. The multidirectional transmitter (MDT) with flexible Spatial Modulation (SM) is highly energy coherent. To overcome intention of reduce power utilization [6]. The Visible Light Communication (VLC) is one of highly investigated environment and become sensitive issue in the last few years of open space transmission. The intention behind its high prevalence is because of its propensity to deliver high data rates, high bandwidth and very fixed medium of communication as it can't sting the walls. The collision of audio transmission in visible light communication is explores under the various conditions such as distance from the source, interfering lighting etc., audio transmission over the VLC is done by the specification [7].

3. PROPOSED WORK

Our proposed work focuses on the use of LED for layout the data communication like video by Li-Fi technology. Transmission is executed by switching LED light ON and OFF. In this setup the transmission distance between receiver and transmitter is 1m at the 31 bytes/s. For video communication we used Eclipse software, which is the combination of Java and Oracle.

3.1BLOCK DIAGRAM

TRANSMITTER SIDE

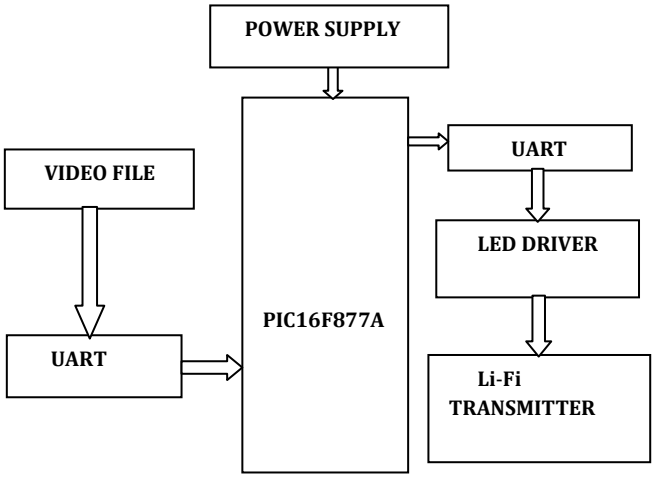

Fig – 1: Transmitter Block Diagram.

The step involved in the above process is given below:

- ✓ The device is switched ON, the video from PC is transmitted to UART through the USB cable.
- ✓ For direct and fast connection, RS232 level serial UART interface to USB is done by using the USB to RS232cable. The length of the cable is 0.8m which is wire shielded.
- ✓ The UART (Universal Asynchronous Receiver and Transmitter) board is an asynchronous serial transmission hardware equipment.
- ✓ UART transmit the individual bits by taking bytes of data in a sequential manner. Input and output shift register, read/write logic control, clock generator, transmitter/receiver control are elements of UART.
- ✓ For the transmission of data from UART, we are using PIC16F877A controller in this project. It has the capability of interrupt upon 14 sources.
- ✓ It is a high rate and low power CMOS FLASH/EEPROM technology. Its voltage range is from 2V to 5.5V.
- ✓ When the PIC16F877A receives the UART data, it converts the data into TTL [Transmitter-Transmitter Logic]. TTL is from the bipolar junction transistor logic family. The transistor implements both the operation of logic and amplification.
- ✓ The Transistor-Transistor Logic works on the constant current flow from the positive rails between the resistor and into the multiple emitter transistor. From the base emitter junction, the current is passed to the output transistor. The performance and pulling of the output voltage are allowed in TTL.
- ✓ From UART the data is transmitted to a LED driver. The main application of LED driver is to retrieve high voltage direct current, alternative current to low voltage. The voltage or current fluctuation in a LED is preserved by LED driver. In this paper the LED driver converts the video into light with the same frequency which it receives.
- ✓ Li-Fi Transmitter receives the light from the LED Driver.

Fig - 2: Transmitter Kit.

RECEIVER SIDE

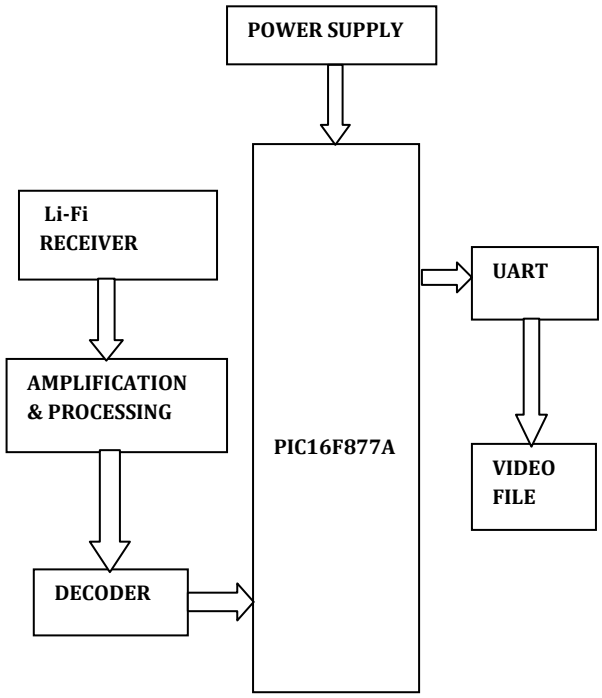

Fig - 3: Receiver Block Diagram.

The steps involved in the above process is given below:

- ✓The photo detector receives the data in the form of light from the Li-Fi transmitter. Photo detector belongs to the family of light detector, which transform light into current or voltage based on the bases of device work mood.
- ✓For the sensing of light, photo detector is cast-off in the optical power exhibition. The amplifier is used for amplify the atmospheric light, and it decode the light into video.
- ✓The PIC16F877A receives the data and Li-Fi receiver secure the data via UART.
- ✓The video in the UART is transmitted to the Personal Computer through USB cable.

Fig – 4: Receiver Kit.

4. SIMULATION RESULT

4.1TRANSMITTER SIDE

The steps involved in the Transmitter side:

- ✓Open the Li-Fi transmitter software and click the Li-Fi transmitter setup.
- ✓Click Setup.EXE. shown in the Fig 5.

Fig - 5: Transmitter Setup.

- ✓Transmitter page will appear, choose the port which is connected to transmitted kit
- ✓Click the open file and select the video file which we have to transmit.
- ✓Click send button. Shown in Fig 6.

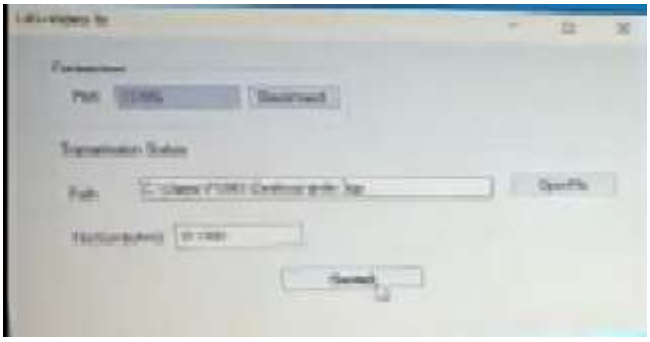

Fig – 6: Video Transmitter.

4.2RECEIVER SIDE

The steps involved in the Receiver side:

- ✓ Create a new folder named as video in Local Disc C.
- ✓ Open Li-Fi software in that open Li-Fi receiver setup. Shown in Fig 7.

Fig - 7: Receiver Setup.

- ✓ Click Setup.EXE, receiver page will appear.
- ✓ Choose the port which connect to receiver kit and click the connect button to make a connection.
- ✓ The receiving video will be store in the video which we created. Shown in Fig 8.

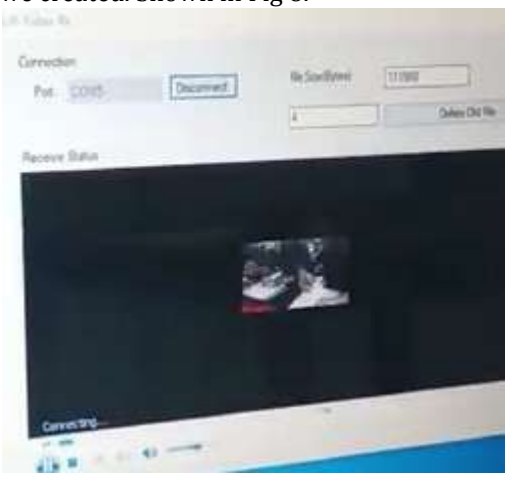

Fig - 8: Video Receiver.

4.3 RESULT

In this paper we have transmitted the video successfully by using Li-Fi technology. We transmitted the video in the range of 111.98KB and the duration is 30seconds in the distance of 1metre. Time taken to receive the video at the receiver side is 1minute and 30seconds. Normally, the Li-Fi speed is 224GB/s but this time delay is due to USB to RS232 converter which is used to transmit/receive the video.

5. CONCLUSION

Li-Fi is developing technology, it overcome all the demerits of Wi-Fi. Li-Fi is free from radiation which can be used in the wide range of applications like Hospitals, Industries, Power plants, Aero-planes, Radiation restricted area, etc., In this paper, we used the USB to RS232 converter which take more time to transmit/ receive the data. If we use other equipment instead of USB to RS232 converter it will take less time to transmit/receive the data.

REFERENCES

[1] R.Trestian, I. S. Comsa, and M. F. Tuysuz, "Seamless Multimedia delivery within a heterogeneous wireless networks environment: Are we there yet?" IEEE Communications Surveys Tutorials, pp. 1-1, 2018.

[2] S. Comsa, R. Trestiar, and G. Ghinea, "360 mulsemedia experience over next generation wireless networks-a reinforcement learning approach," Sardinia, Italy, May 2018.

[3] Cisco Visual Networking Index: Globle Mobile Data Traffic Forecast Update, 2016-2021 White Paper, Cisco Mobile VNI, San Jose, CA, USA, Mar. 2017.

[4] R. Bian, I. Tavakkolnia, and H. Haas, "15.73 Gb/s visible light communication with off-the-shelf LEDs," J. Lightw. Technol., vol. 37, no. 10, pp. 2418-2424, May 15, 2019.

[5] WPANTM 15.7 Revision: Short-Range Optical Wireless Communications Task Group (TG 7R1), IEEE Standard 802.15,7, Apr. 2018.

[6] Mohammad DehghaniSoltani, Mohamed Amine Arfaoui, Iman Tavakkolnia, Ali Ghrayeb, Majid Safari, Chadi M.Assi, Mazen O. Hasnaand Harald Haas, "Bidirectional Optical Spatial Modulation for Mobile Users:Toward a Practical Design for Li-Fi Systems", IEEE Journal, Vol.37, No.9, September 2019.

[7] Fabian HarrendranJesuthasan ,Hardik Rohitkumar, Purav shah, Huan X. Nguyen and Ramona Trestian, "On the Impact of Visible Light Communication for Audio and Video Transmission", IEEE 2018.

[8] G. N. P. Box et al., Time Series Analysis: Forecasting and Control. Hoboken, NJ, USA: Wiley, 2015.

[9] J.Vucic and K. D. Langer, "High-Speed visible light communications: State-of-the-art," in OFC/NFOEC, March 2012, pp.1-4.

[10] D. K. Son, E. B. Cho, and C. G. Lee, "Demonstration of visible light communication link for audio and video transmission," in Photonics Global Conference, Dec 2010, pp. 1-4.

[11] S. Wu and H. Wang, "Visible light communication for 5g wireless networking systems: from fixed to mobile communications." IEEE Network, vol. 28, no. 6, pp. 41-45, 2014.

[12] C. V. N. Index, "Forecast and Methodology, 2015-2020 White Paper, Cisco, 2016." 2016.