

Wireless Audio Signal Communication using Li-Fi Technology

G Ramprabu, T Saravanan, G Saritha

Abstract: As a next generation signal processing method, Visible Light Communication (VLC) is developing for low distance signal processing applications. Two archetype wireless audio data processing techniques are executed and described using VLC. For stream and process data, software design is urbanized and it is linked with a hardware element, by encouraging free-space VLC canal, over a Universal Serial Bus (USB) to serial interface. An especially appealing element of our framework is that it utilizes generally accessible, minimal effort elements by empowering its execution in ordinary purposes. The scheme incorporates both transmission and reception section. The transmission section comprises of voice playback with a system contribution from which the voice is transmitted by means of light transmission and the voice gets got in a light reception and opened up in audio amplifier.

Index Terms: Visible Light Communication, LED, LCD, Wi-Fi and Li-Fi..

I. INTRODUCTION

Li-Fi is a rapid, wireless signal processor using visible light communication. It falls under the class of optical signal processing. Data communication happens through LED knobs whose power differs. In view of this variety, process happens carefully (Ramprabu *et al.*, 2017). By Harald Haas from Edinburgh University, the word Li-Fi was initially authored. This innovation has huge applications where the utilization of Wi-Fi is constrained or restricted. Additionally it gets out the unfavourable wellbeing impacts of utilizing electromagnetic waves. Except light is spot, information can't be chopped thus information communication is protected. Information communication is ordinarily regarding Giga bytes every second (Shivaji *et al.*, 2016). Signal processing is one of the necessary elements of anyone for trading data on gadgets in wired or remote systems. With the presentation of new cell phones, wireless data processes have turned into the essential need of our lives (Sunita *et al.*, 2016). Visible light communication (VLC) is another method of wireless data processing using visible light. Visible light is the type in which electromagnetic radiation with wave lengths in a meticulous value is inferred by the human brain. Visible light

is in this manner by definition included outwardly distinguishable electromagnetic waves. The noticeable range covers wave lengths from 380 nm to 750 nm. At the lower end of the range there are violet-somewhat blue tones and light at the opposite end of the range is translated to be particularly red (Karthika *et al.*, 2015)

II. METHODOLOGY

Li-Fi utilizes light to transmit information not at all like Radio waves. LiFi is fast bi-directional organized and portable correspondence of information utilizing light. LiFi includes different lights that shape a remote system, offering a generously comparative client experience to Wi-Fi with the exception of utilizing the light range.

Wherever, have lights will have the web association however here, the term light does not allude to normal glowing lights in home, these are uncommonly altered LED lights which can transmit information. As, LED is a semiconductor gadget and like all semiconductors it has exchanging properties. This exchanging property is utilized to transmit information.

Table.1. Characteristic of Wi-Fi

Characteristic	Wi-Fi
Standard	IEEE 802.11
Range	100 meters
Primary application	Wireless LAN Cost- Low Medium High
Data Transfer Rate	800 Kbps – 11 Mbps
Power Consumption	Medium
Cost	Medium
Security	Medium Secure

Table.2. Characteristic of Li-Fi

Characteristic	Li-Fi
Standard	IEEE 802.15
Range	Based on LED light
Primary application	Wireless LAN
Data Transfer Rate	>1 Gbps
Power Consumption	Low
Cost	High
Security	High Secure

Each LED light ought to be controlled through a LED driver, this LED driver will get data from the Internet server and the information will be encoded in the driver. In light of this encoded information the LED light will flash at a fast that can't be seen by the human eyes.

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In any case, the Photo Detector on the opposite end will have the capacity to peruse all the flashing and this information will be decoded after Amplification and Processing.

The information transmission here will be quick than RF. As a whole know light ventures quicker than air that is the light is ten thousand times speedier than Radio waves since the recurrence of Radio waves are only 300 Giga hertz however light can go up to 790 Tera hertz. The characteristic of Wi-Fi and Li-Fi technologies are shown in the table 1 and 2.

Li-Fi method utilizes the modulation techniques (Anurag *et al.*, 2015) such as Variable Pulse Position Modulation, On-Off Keying, Sub Carriers Inverse PPM, Color Shift Keying, Sub Carrier Index Modulation OFSM and Frequency Shift Keying.

The common expression VLC embraces any utilize of the visible light segment of the EM spectrum to send data (Jitender *et al.*, 2014). Principle segment of the Li-Fi innovation: LED: At the sending side controller that code the information into LEDs, all the one needs to do is to differ the rate at which LED is glint contingent upon the information needs to encode. The rate of gleaming is high so that can't recognize light for the human eye. In this utilizing exhibit of LED for parallel information transmission or utilizing blends of the red, green, blue LED's to change the light's recurrence with every recurrence encoding of various information channel. Silicon Photodiode: At the beneficiary side photodiode is utilized, it demonstrates great reaction to the noticeable wavelength area. For tolerating the fluctuating light only unique string of coded information, LED on implies digital data "1" and LED off means digital data "0". The Li-Fi producer framework comprises of some essential sub gatherings: a) Bulb b) RF control speaker circuit c) Printed circuit board d) Enclosure (Sunita *et al.*, 2016). The figure 1 demonstrates the illustration for the components of Li-Fi method.

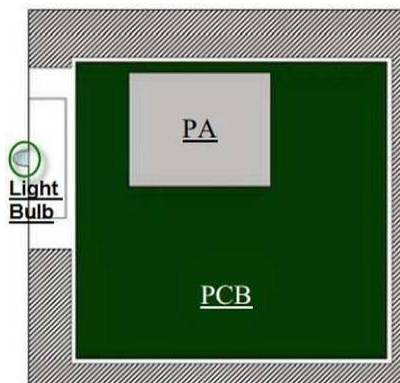


Fig 1: Elements of Li-Fi Technology

In transmission unit, the info sound flag is given to the MIC and it is then given as the contribution to the voice playback (Ramprabu *et al.*, 2017). The portable info together with the voice playback is given to the PIC microcontroller. The pic controller drives the LCD to show the instatement and transmission warning. The DC control is given to the PIC controller through the power supply. At that point the controller is given to the Li-Fi transmitter module. The Li-Fi transmitter module involves a transmitter circuit and a white LED. In view of the power of the light from LED,

transmission of sound happens. The square chart for the Li-Fi transmitter module is as appeared in the figure 2.

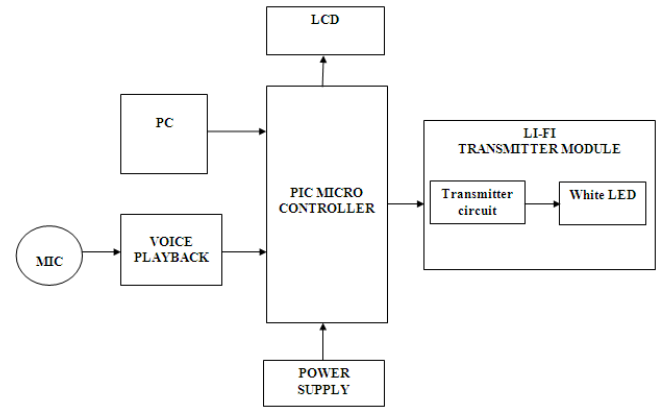


Fig 2: Block Diagram of Li-Fi Transmitter

In reception unit, the transmitted sound is given to the Li-Fi collector module. It involves an identifier and an intensifier (Shivaji *et al.*, 2016). The finder detects the information in view of the power of LED light and the intensifier wipes out the clamor that is transmitted alongside the sound flag. At that point it is again given to PIC microcontroller and after that the yields opened up utilizing sound enhancer and speaker is utilized to recuperate the sound yield. The square chart for the Li-Fi collector module is as appeared in the figure 3.

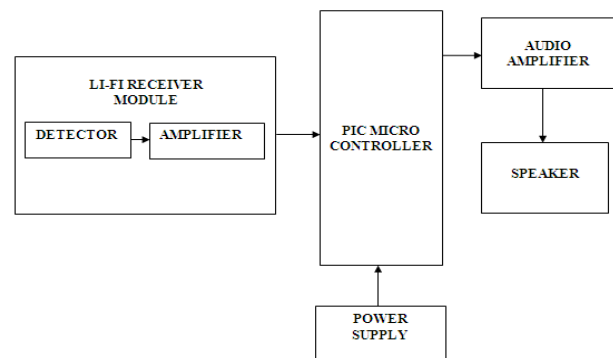


Fig 3: Block Diagram of Li-Fi Receiver

In the model, if the LED is ON, the advanced information 1 will be transmitted. In the event that it is OFF, 0 will be transmitted. The primary favorable position on utilizing LED is that, LED's can be turned ON and OFF unobtrusively, which is utilized for passing on information effectively (Ramprabu *et al.*, 2017). The encoding of information ought to be such that the LED's flicker in like manner. The LED light is being balanced with the information signals in light of the LED brilliance that can be utilized as a correspondence medium. The LED's gleaming rate is speedier, that it seems consistent to the human eye. Information rates more noteworthy than 100 Mbps are conceivable utilizing fast LED's.

III. RESULT AND DISCUSSION

The future scheme is fully depends on the greatness of light from LED. It attains an accuracy of $\approx 80\%$.



It sends around 10 to 100 times of data compared to Wi-Fi, and the LED even enhance as high as greater than 100 times. According to resources, the LED empowered signal process conveyed data at a speed of ≈ 1 Gbps, as beside Wi-Fi's average speed of ≈ 3.5 Mbps. With force modulations, Li-Fi has even attained data transfer rate of ≈ 4 Gbps.

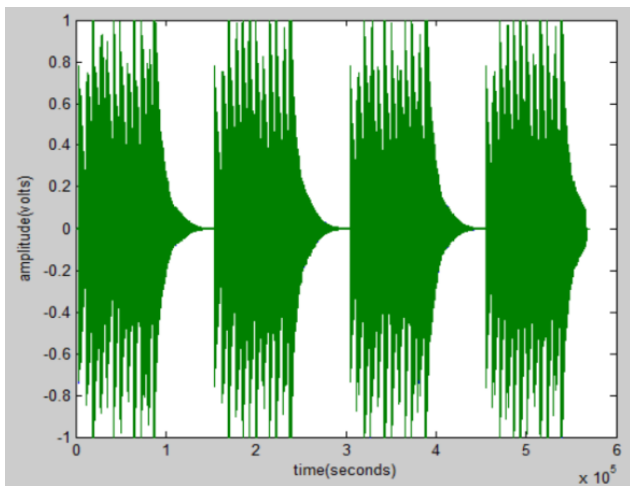


Fig 4: Transmitted Signal through Li-Fi

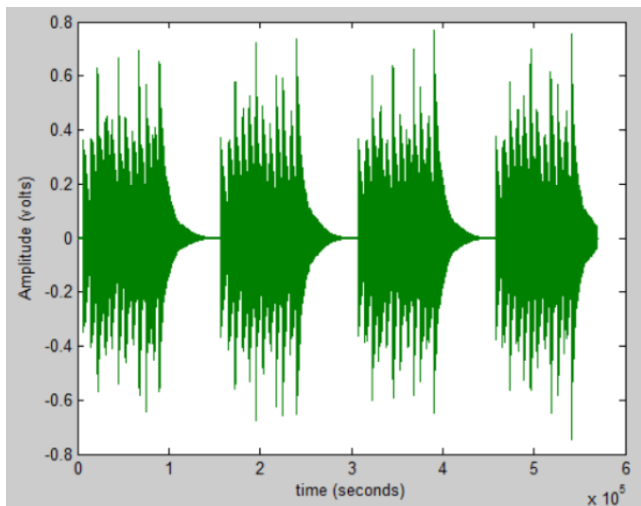


Fig 5: Received Signal from Li-Fi

Simulation result of both transmitted signal through Li-Fi and received signal from Li-Fi technologies are shown in figure 4 and 5 simultaneously.

The simulation results shows that both transmitted and received signals are almost same and its given better performance of transmission for communicating audio signal through Li-Fi technique.

IV. CONCLUSION

The wireless data process gets position from cell phone to audio speaker in the proposed method by VLC method. In the near prospect internet signal process will be altered from RF wave range to VLC range. Li-Fi method will trade Wi-Fi method souks as a result of secured data, high transmission rate, free range of band of infinite range of frequency and the energy utilization.

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Dr. G. Ramprabu has completed U.G. – B.E. (Electronics and Communication Engineering), P.G. – M.E. (Applied Electronics) in Anna University and he has completed Ph.D. (Electronics and Communication Engineering) in Hindustan University. He has published 8 books for various university syllabuses and has published various papers in National and International Conferences, Journals. He is a Life member of ISTE, Fellow of ISRD and Member of IAENG. He is currently working as Director-Research & Associate Professor at a college affiliated to Anna University in Tamilnadu, India.