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Li-Fi: Light Fidelity Using UART

[1]Sudheer Prajapati, [2]Sitanshu Ranjan,[3]Utkarsh Shukla, [4]Ritesh Kumar Mishra, [5]Mahesh Kumar Singh

[1234]Student of Electronics and Communication Engineering, [5]Assistant Professor of Electronics and Communication Engineering

[12345]Department of Electronics and Communication Engineering,

[12345]Buddha Institute of Technology, Gorakhpur, India

Abstract: *Li-Fi known as Light Fidelity, and it is an emerging technology in the field communication. Li-Fi is a communication technique, which work on Visible Light Communication, and it has wavelength range from 375 nm to 780 nm. LEDs used for high-speed wireless transmission in a full network, which is known as Li-Fi. The simulation of transmission and reception of data is done using YAT terminal. The wide bandwidth in VLC -as it works in the THz range of frequencies, the high transmission data rates reaching to Gigabits, the increased level of security for a reliable transmission of data, and the low power consumption are the main benefits that we get from the Li-Fi technology if it is compared with Wi-Fi.*

Keywords: LI-FI, WI-FI, Visible Light Communication, Radio Spectrum, UART.

I. Introduction

Nowadays communication is daily need to the human life. Every user need a high speed data transmission so Li-Fi is best fitted technology for present time and the future. As light is omnipresent and Li-Fi uses light as a transmission medium. In our prototype we have used the UART module (Universal Asynchronous Receiver Transmitter) which has no clock pulse, for synchronization it uses one start and one stop bit before and after transmission of every single byte. In Li-Fi we can use an ordinary led bulb as transmission source so it is easy to install at any closed room.[1]

II. Working of Li-Fi

Li-Fi has two main components which are LED and photodiode. In Li-Fi input signal is first passed through the ADC and then converted to the binary data and send to the high illumination led circuit [3], which produces illumination as well as the transmission of data in the form of flickering. As Flickering is quite fast hence it can't affect the illumination and can't be seen through human naked eyes. While reception of the signal the signal is first sent to the photodiode which convert the light energy to the electrical energy. Electrical signal is passed to through the voltage comparator, which separates the binary '0' and '1'. Using the YAT terminal.

III. Methodology

Figure 1 shows the block diagram of the Li-Fi. There are two sections: transmitter and receiver. The transmitter circuit is connected to the first pc using the UART Module (CP2102). Figure 2: shows transmitter section input data is first converted to the binary data and fed to the led driver and led is blink according to the data fed to the led [4]. Similarly at the end of receiver circuit UART is connected and UART plugged to the second pc via USB (Universal Serial Bus). Figure 3: shows receiver section the light is first fall on the photodiode (BPW34) which main work is to convert the light energy to the electrical energy. The received signal is then pass through the dual stage inverting amplifier (LM358).

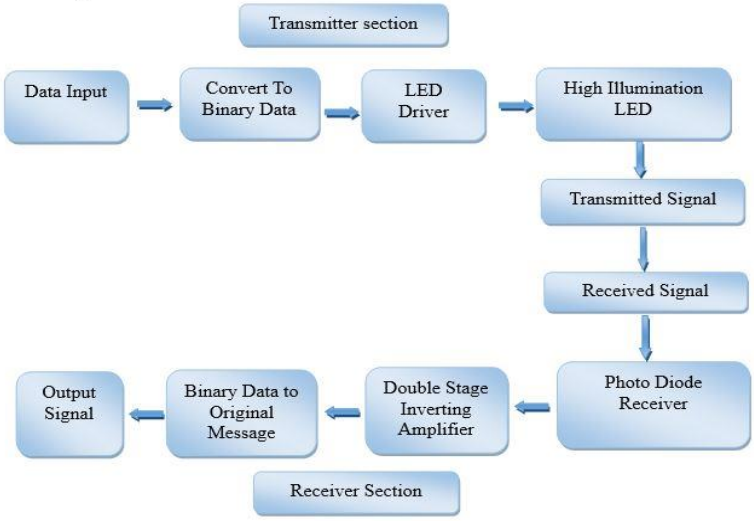

Figure 1: Block Diagram of Li-Fi

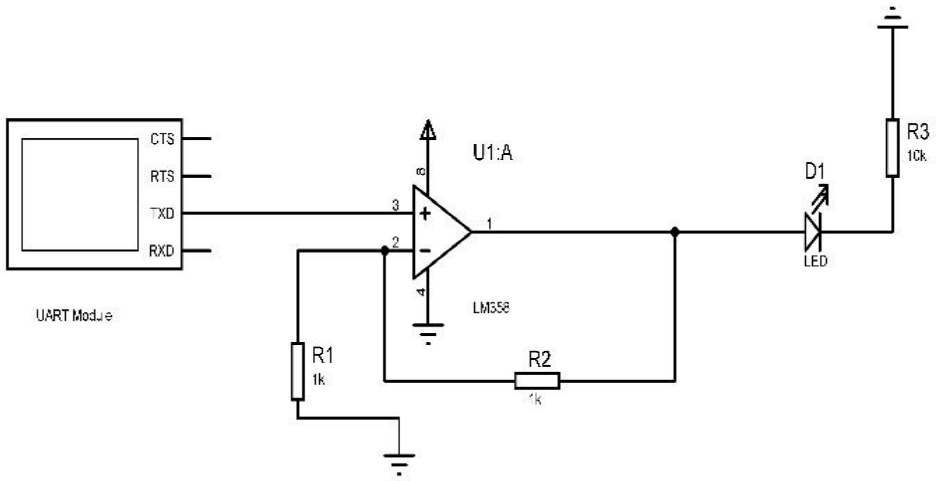

Figure 2: Transmitter of the Li-Fi

It is also known as the comparator so it compares the high voltage and the low voltage which is binary data received. After some processing through YAT terminal the original message is received.

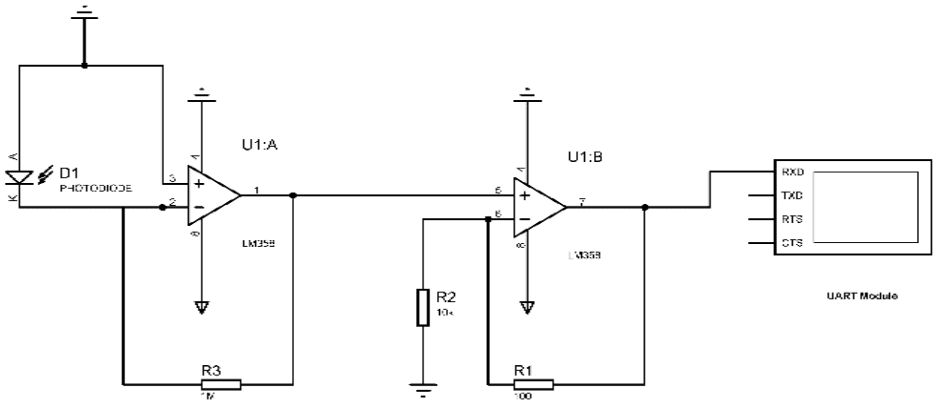

Figure 3: Receiver of the Li-Fi

Figure 4 shows the real time data transmission and reception on the YAT terminal.

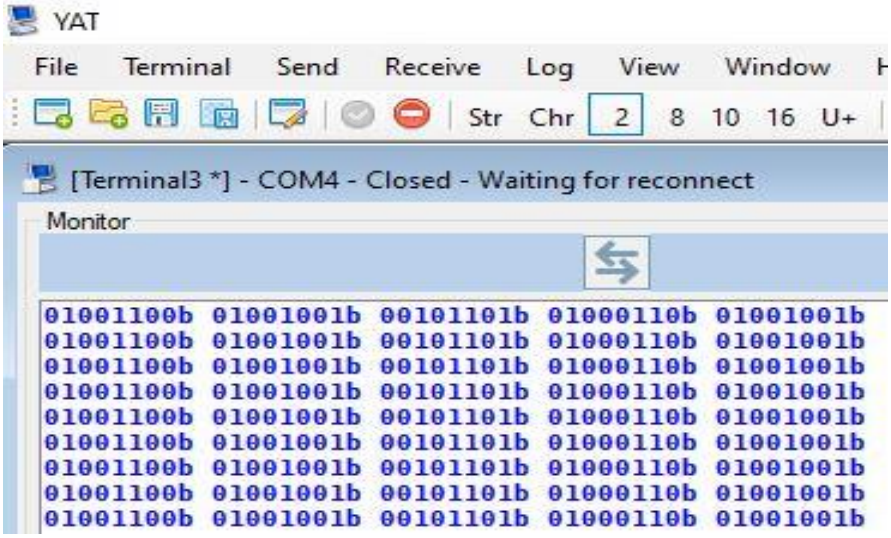

Figure 4: Transmission of data on YAT

Similarly in Figure 5: shown the reception of the actual data on YAT terminal.

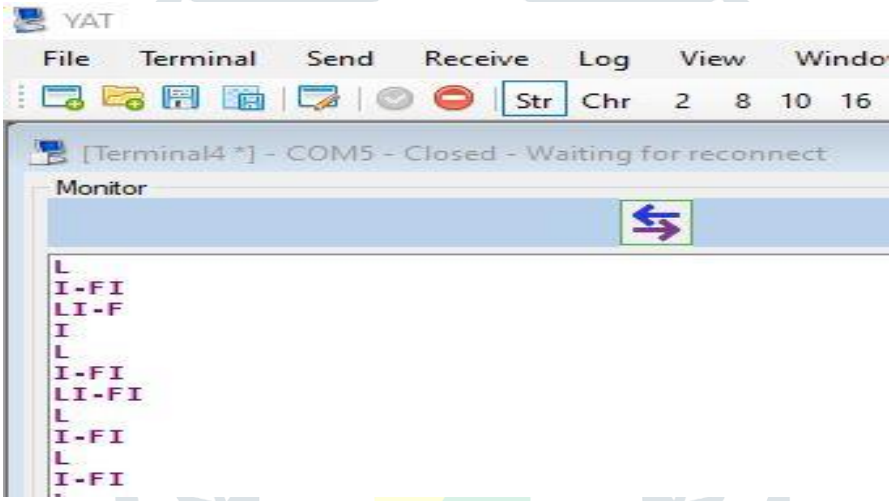

Figure 5: Reception of the data on YAT

As we are using the UART (Universal Asynchronous Receiver Transmitter) it uses the 1 start bit before sending any data similarly it sends 1 stop bit after the ending of every single byte for the synchronization between the transmitter and the receiver.

IV. ADVANTAGES:

I. As it uses the light as transmission medium so light cant penetrate through the walls so it can't be hacked.
II. In Wi-Fi due to electromagnetic radiation the airlines never allow to use mobile phone but in Li-Fi, we can use it without any issue.
III. It doesn't have radiation so it can be used in the medical area also.
IV. It has the 10000 times more bandwidth of entire radio spectrum.
V. It gives 100 times faster speed as compared to the traditional Wi-Fi.

V. LIMITATION:

The only limitation of the Li-Fi is the direct line of sight (LOS) needed between the transmitter and the receiver.

VI. CONCLUSION AND RESULTS:

The proposed system has transmitter consist of UART module, LM358 ic and led driver. Receiver consist of photodiode LM358 ic as voltage comparator and the UART module. The protype is tested in different distances, maximum 20cm which working perfect. For the Bit Error Rate we have sent infinite loop of letter from tranmitter end and observed that and calculated the the bit error rate is less than 10^{-9}. But while increasing the distance more than 20cm the received signal has some error bit found. To reduce the bit error we can use the concave mirror infront of the Photodiode (BPW34) so that the incoming light dirctly focused to the photodiode(BPW34).[2]

VII. REFERENCES:

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