



Li-Fi Communication for Transmitting Data, Audio and Image Information

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ABSTRACT

LI-FI communication is one of the advanced technologies for communication purpose. The efficiency, durability, and lifetime of light-emitting diodes (LEDs) have led to their use in a variety of applications, including audio transmission, text transmission and image transmission. LI-FI communication is also called as the Visible Light Communication (VLC) here we use the visible light for transmitting the data, audio, text and image. It is the one of the fastest communication which compared to the WI-FI communication and also due to the VLC we can use different wave length for different speed of transmission. We have designed a prototype LI-FI system to transfer audio as well as text and image . Our idea is to send audio, text and image as serial datas using UART serial communication from one PC to another PC using VLC.

Keywords : LiFi (Light Fidelity), WiFi (WirelessFidelity), VLC (Visible Light Communication), LED (Light Emitting Diode)

I. INTRODUCTION

There are over 5 billion mobile phones which can use 1.4 million mast cellular radio waves base station. LI-FI stands for Light-Fidelity which is invented by Harald Hass. LI-FI is transmission of data using visible light by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. A communication system can classified into two types i.e Wired communication and Wireless communication. Presently wireless communication uses radio waves. Spectrum is the one of the most essential requirement for wireless communication. With the advancement in technology and the number of users, the existing radio wave spectrum fails to cater to this need. To resolve this problem we use the LI-FI communication in this information can be transmits through the LED's which is much faster and flexibility than the radio wave communication.

Visible light communication (VLC) is a new way of wireless communication using visible light. Typical transmitters used for visible light communication are visible light LEDs and receivers are photodiodes and image sensors. 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 and by using simple audio transreciever circuit we can transmits the audio also Design and implementation.

II. OVERVIEW OF LI-FI

LI-FI stands for LIGHT FIDELITY. LI-FI is transmission of data through illumination by taking the fiber out of fiber optics by sending data through a LED light bulb that varies in intensity faster than the human eye can follow. LI-FI is the term some have

used to label the fast and cheap wireless-communication system, which is the optical version of Wi-Fi. Light reaches nearly everywhere so communication can also go along with light easily. Light Fidelity is a branch of optical wireless communication which is an emerging technology.



Fig.1 Basic LI-FI overview

By The professor of mobile communications at the University of Edinburgh, UK, first time publically displayed the proof of Light Fidelity(Li-Fi), a method of Visible Light communication(VLC). Li-Fi is the transfer of data through light by taking fiber out of fiber optics and sending data through LED light. LI-FI technology provides transmission of data through illumination by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. Wi-Fi is great for general wireless coverage within buildings, whereas LI-FI is ideal for high density wireless data coverage in confined area and for relieving radio interference issues. LI-FI provides better bandwidth, efficiency, availability and security than Wi-Fi and has already achieved blisteringly high speed in the lab. By leveraging the low-cost nature of LEDs and lighting units there are many opportunities to exploit this medium, from public internet access through street lamps to auto-piloted cars that communicate through their headlights. Haas envisions a future where data for laptops, smart phones, and tablets will be transmitted through the light in a room

UART

The UART is defined as Universal Asynchronous Receiver/Transmitter. The control operation of UART can be control by clock which runs multiple data. In UART mostly 8 times the bit rate is used. Start bit is high initially and when the start bit goes low, the UART starts its process. The stop bit is high after receiving the 8 bits. The fig 3 shows the wave form of UART.

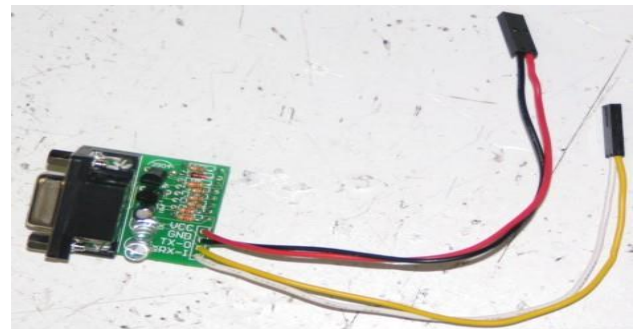


Fig.2 UART

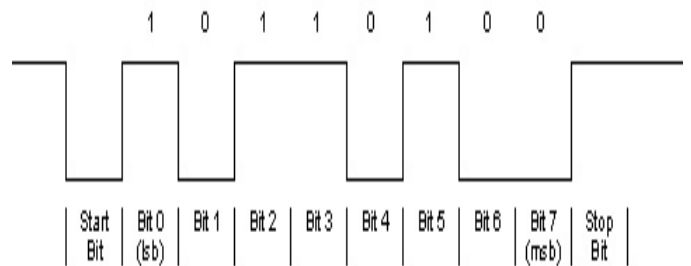


Fig. 3 Wave form of UART

Block Diagram of Li-Fi Communication System

Fig.4 Shows The Block Diagram Of Li-Fi Communication System.

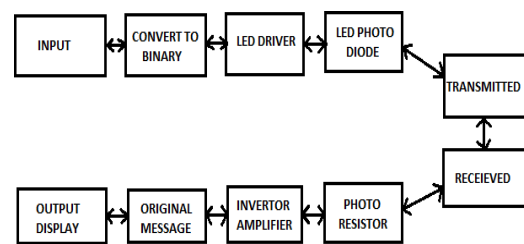


Fig.4 LI-FI communication system

The LI-FI communication system consists of Binary converter, LED driver, LED photo diode, Transmitter, Receiver, Photo resistor, Inverter Amplifier. When the input is given to system which is in the form of analog, so it has been convert to digital. The binary convertor will convert the analog signal to binary signal which helps to communicate very easily. Then these binary signals are drive through the LED Driver, this Driver will convert the binary to high illumination light through a LED which can blink continuously hence the data can transmitted through transmitter.

In other side the receiver can receive the transmitted signal, this receiver consists Photo resistor which can detect the light source consisting of information. This information again converts to analog with help of Inverter Amplifier and finally the original analog information can display at output.

HARDWARE REQUIREMENTS

- Arm 7 lpc2148
- Max 232
- LM386(audio amp)
- Transistor Bc337
- Inverting Buffer Amplifier
- Photo transistor ST1kl38
- High wattage LED
- Power supply LM317 5V
- MATLAB (image)
- Keil (arm programming)
- Solar cell
- Terminal software (text)
- Transformer 6-0-6 500mA

III. AUDIO TRANSMISSION

The LI-FI is transfer data through visible light. Since the bandwidth of visible light is 10,000 times more than Radio waves, more data can be transferred through light at short period of time with

continuously blinking the LED in which the data can transmits. Let coming to the part of audio transmission, transmitter consisting the audio signal from the mobile phone as a input which connect through the audio jack and this audio signal will converted to digital and transmitting through the LED, at the receiver which consists photo resistor which detects the LED information and converts to analog which can processes through the basic audio amplifier with high gain can boost audio signal and finally the audio can transmitted through the speaker .

Image and Text message transmission

Here the MATLAB is used to transmission the images between the two PC's. Initially the transmitter has input images are in the form of analog image components, by using MATLAB code the image can be converted to digital. This digital image process for objective checks for transmission quality and then it will serially transmitted through a LED. At the receiver these digital image can be received and convert to analog which can be process for objective transmission checks and finally the original image will display on the PC's . In the same way as Image, the Text messages also transmits between the two PC's in this we will use the Terminal Software. Here in the transmitter consists text as a 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 analog and display at the output Here we use the buffer inverter IC for fast transmission.

IV. RESULT AND DISCUSSIONS

The Li-Fi system proposed in this paper is capable of transmitting data such as text, image, audio between

two devices at the speed of a few kbps. The working model and output of the LI-FI communication for transmitting audio, text and image as shown in the fig.5

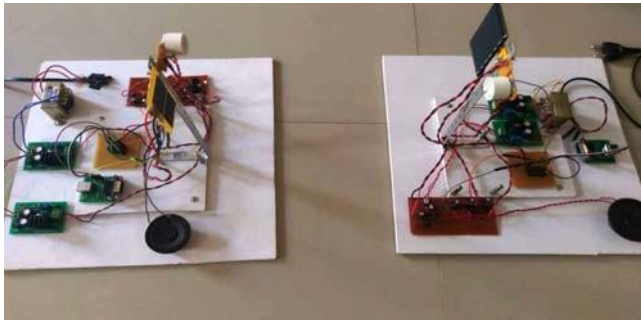


Fig. 5 Working model of the LI-FI communication
 The main requirement is line of sight between the sender and the receiver and hence it can be used to transmit data within a room. Li-Fi technology is based on (Visible Light Communication) VLC technology. VLC is one of the advanced optical wireless communication technologies in which light in the visible region is used as a medium for data transmission. It is more secure and achieves high data rates as compared to conventional wireless technologies like Wi-Fi, Bluetooth, etc. The data can transmit serially through an LED using UART, here the text can be converted into ASCII and then it transmitted and we can adjust the baud rate with the range of 19200 which helps to transmit at faster rates. The fig.6, 7.a, 7.b, 8.a, 8.b shows the data, Text and Image transmission and reception respectively.



Fig.6 Data transmitted serially



Fig.7.a Text transmitted serially

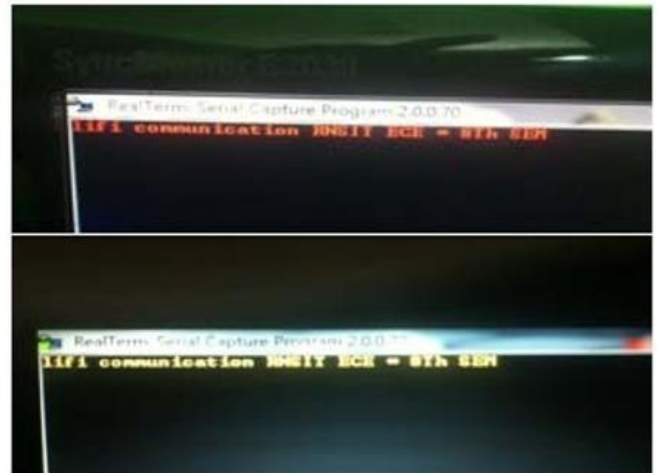


Fig.7.b Output of Text Transmission and Reception



Fig.8.a Transmitted image



Fig.8.b Reconstructed image

V. CONCLUSION

Through a wireless communication by using VLC we can transmit 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 proceed towards greater, safer and cleaner future.

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