

Text Transmission using Li-Fi

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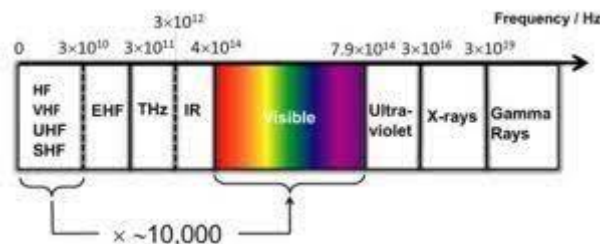
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Abstract: Li-Fi (Light Fidelity) is a high speed, wireless communication using light. It can be considered under optical wireless communication category. Data is transmitted through Light Emitting Diode bulbs whose intensity varies. Depending on this variation, communication occurs digitally. This technology has broad applications where the use of Wi-Fi (Wireless Fidelity) is restricted or banned. This paper aims to show the transmission of text data from one PC to another PC using Li-Fi which has more advantages than Wi-Fi. For e.g., Li-Fi also eliminates adverse health effects of using electromagnetic waves. Unless illumination is seen, data can't be hacked, therefore data transmission is secure.

Keywords: Light Fidelity, optical wireless communication, Light emitting Diode, Text data Transmission, wireless fidelity.

I. INTRODUCTION

The usage of illumination to transmit data has been coined Li-Fi (Light - Fidelity) by Harald Hass at the University of Edinburgh [2]. The Communication technology which is high speed can be compared to Wi-Fi but it is quicker, allowing users to send and receive more data in less time. By merely swapping incandescent bulbs with LEDs - which have electronic properties - Li-Fi could bring the Internet gain access to more areas and will revolutionize the telecoms industry. Recently, wireless technology has bloomed to an excellent extent where we require wireless technology to transmit a lot of data on a daily basis. Nowadays, wireless communications have become important within the communication process. The first way of wireless data transmission is by using electromagnetic waves, i.e., radio waves. However, radio waves can support less bandwidth due to compact spectrum availability and intrusion. Solution to the present is data transmission using visible radiation Communication (VLC)[1].



The speed of data transmission was about 10Mbps, though it's aimed to enhance up to 100 Mbps[3]. Li-Fi is often achieved by fitting a microchip to each possible illumination device thereby, combining two basic functionalities: illumination and wireless data transmission. By doing this, the four essential problems (i.e., capacity, cost, efficiency, and security) faced in wireless communication lately would be solved.

II. LITERATURE SURVEY

1. Abhiramasundary dept. of ECE PITS, Shwetha dept. of ECE PITS Thanjavur (2018), Real time embedded health monitoring system using Li-Fi [4] - They utilized Transmission of data through Light for medical applications such as embedded health monitoring systems. Utilization of ARM was done to retrieve information from the receiver which consists of Body temperature sensor, ECG sensor, SPO2 Sensor, Pulse rate sensor etc. This provides us with an opportunity to utilize Li-Fi in radio sensitive areas such as Hospitals, as home resided patient monitoring systems and wearable devices like wrist watches.

2. R. Bhavya and R. Lokesh M., (2016), A Survey on Li-Fi Technology [5] - The design of Li-Fi was studied as a new wireless technology that works in providing connectivity within a given network environment. The working of Li-Fi Technology provides us with a way to transfer data and this is done by sending information through an LED. This LED has varying intensity at a pace so fast that the human eye cannot follow it. There is no doubt that there is a bright future for such a technology that uses VLC technology. The idea of "Every bulb can be used as a source for the Internet" i.e., like a hotspot to transmit wireless data. This idea also promotes us towards a brighter future with a clear visualisation of a cleaner, greener, safer and a brighter future. Their objective and approach is very similar to our goals of this project.

3. Shilpi Mishra, Implementation of A Simple Li-Fi Based System [6] - This research focuses on using Li-Fi technology for transmission of text data, audio as well as video data. This process demands a comparatively more complex transmitter which involves the use of PCB. This is used in order to control and alter the light intensity of the LED. This research hence, proves to be an advanced version of the project we currently focus on, which simply demonstrates the transmission of text data. There is also incorporation of RGB LEDs (red, green, blue) in order to enhance the rate of transmission of data. Use of Photo-transistor instead of an LDR like in most cases improves the efficiency of receiver design.

4. G Madhuri, K Anjali and R Sakthi Prabha, Transmission of data, audio and text signal using Li-fi technology [7] - There is a detailed demonstration of image transmission. We observe the utilization of transceivers which are connected to both PCs between which communication takes place. The advantages of using LEDs in the transmitter system which include eco-friendly LEDs, having a better performance, flexible design and also a better life, are mentioned here.

III. OBJECTIVE & METHODOLOGY

- The aim of this project is to design and construct a data transmission system (made up of the receiver and the transmitter) that transmits text data effectively using Li-Fi technology. The Objectives of the project are: To design and construct the transmitters as well as receiver's microcontroller units. To Implement the code on the PC (Transmitter & Receiver) to enable text data processing. The aim of this project was to design a Li-Fi Data Transmission system to send data (limited to text – strings) from a PC to another PC.

- Methodology: Data transmission using Li-Fi requires a Transmitter system and a receiver system. The transmitter system consists of an Arduino microcontroller which converts the entered input data from text to binary bits. This is transmitted to the receiver in the form of Blinking of LED. This On-Off blinking pattern is detected by the LDR in the receiver system. On state of LED is detected as 1 and Off state of LED is detected as 0. An LDR can be replaced by a Phototransistor in the receiver system. There is another Arduino in the receiver system which performs the function of a decoder and the final output is displayed on the receiver PC. The Block diagram shows a better demonstration of this explanation.

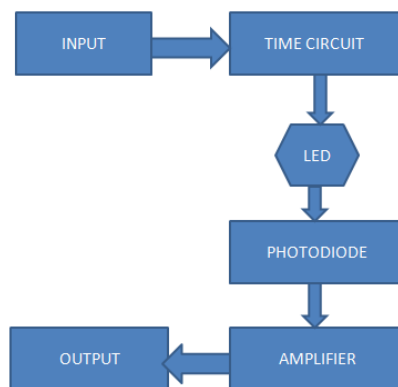


Fig 1. Block Diagram of data transmission using Li-Fi



Fig 2. Project Set up of PC-PC text transfer

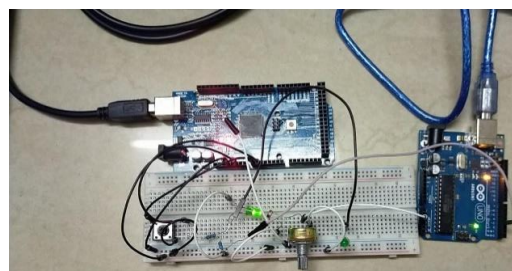


Fig 3. Circuit diagram

IV. ADVANTAGES AND DISADVANTAGES OF LIFI

ADVANTAGES OF LI-FI - Effectiveness: Energy consumption can be minimized with the use of LED illumination that is already available in the home, offices, and shopping mall, etc., for lighting goal. Hence the transmission of data requiring negligible additional power, which makes it very efficient in conditions of costs as well as energy.

High speed: Li-Fi can provide data transfer at a high data rate i.e., 1 Gbps or even beyond with help of proper equipment.

Availableness: Light is present in almost all places. Wherever there exists a light source, there can be an internet connection. Light bulbs are available everywhere – in homes, offices, outlets, malls and even aircraft, which may be used as a medium for the records transmission.

Cheaper: Li-Fi does not require many components for its working and uses just a negligible additional power for the data transmission.

Security: One main good thing about Li-Fi is security. As light cannot go through massive structures, Li-Fi internet is available only to the users an enclosed area and cannot be blocked and misused, outside of the area under operation.

The scope of Li-Fi technology in the future is great. The accelerated growth in the utilization of LEDs for lighting indeed provides the possibility to integrate the technology into an array of environments and applications.

LIMITATION OF LI-FI - The Internet cannot be accessed without a light source. This might add constraints to the areas in which Li-Fi could be used. Obstacles that are opaque can affect data transmission if they are on pathways. The type of light utilized for transmission has the ability to change the data transmission speed because of variation in intensity & other factors. Light waves do not permeate through walls, and so Li-Fi has a significantly shorter range than Wi-Fi. High primary installation cost, if used to set up a full-fledged data network.

V. CONCLUSION

The Proposed system gives us a basic understanding of the idea of transmission using Li-Fi from one PC to another. The aim of this project was to design a Li-Fi Data Transmission system to send Text data. Therefore, a Li-Fi prototype has been designed which demonstrates the basic principle and supports the claim of the advantages of Li-Fi over Wi-Fi. The system demands use of two Arduinos, one on the transmitter section which is connected to LED and the other on the receiver section which is connected to LDR. By changing the time period in the transmitter, speed of data transmission can be improved/changed which is clearly observed in the experiment.

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