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Empowering Realtime Data Transmission Based on Li-Fi Technology

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ABSTRACT: Wireless technology has led to a rapid increase in the number of devices accessing the Internet. However, this has resulted in network complexity, a shortage of wireless radio bandwidth, and an increased risk of radio frequency interference. To address these challenges, Li-Fi technology is used to transmit data using Visible Light Communication through light-emitting diodes. The transmission signal involves using an LED as a Li-Fi transmitter and a photodiode as a Li-Fi receiver. This method of transmission is much more secure compared to existing technologies. Visible Light Communication (VLC) has gained tremendous interest over the past decade due to the rapid advancement in LED manufacturing. LEDs are effective, durable, and have a long life expectancy, making them a promising private lighting hardware and a cheap and quick data exchange equipment. Moreover, the data transmission rate is very high, reaching up to a few Gbps. Our project aims to describe and implement the design of a Li-Fi audio transmission system, utilizing these improvements in hardware to share audio data

KEYWORDS : - wireless technology - sharing data - radio frequencies - Li-Fi transmitter - improvements - hardware - audio.

I.INTRODUCTION

Communication between devices has become very common in today's world. While radio waves are widely used for communication, there are also other options available, such as Wi-Fi and Bluetooth, which are currently the two prominent short-range wireless technologies. However, with the increase in advanced technology and number of users, the network can become overloaded,resulting in a failure to provide high data rates.To solve this issue, Visible Light Communication (VLC) is one potential solution. It involves encoding data in the light by varying the rate at which LEDs switch on and off to provide various strings of 1's and 0's. By quickly switching LED lights on and off, fast pulses of light can transfer data without physical connection, and this is not noticeable to the human eye. The photodiode converts these optical signals to electrical signals, and the original information is recovered.Li-Fi is a technology that transmits data using visible light by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. The idea of Li-Fi was introduced by a German physicist, Harald Haas, who also referred to it as "Data through illumination." The general term Visible Light Communication includes any use of the visible light portion of the electromagnetic spectrum to transmit information.Haas promoted this technology in his 2011 TED Global talk and helped to start acompany to market it. Pure Li-Fi, formerly Pure VLC, is an original equipment manufacturer (OEM) firm set up to commercialize Li-Fi products for integrationwith existing LED lighting systems. According to Haas, the light, which he referred to as 'DLight,' can be used to produce data rates higher than 1 Gigabit per second, which is much faster than our average broadband connection.Li-Fi is a high-speed wireless communication technology that utilizes a frequency spectrum of Electromagnetic Radiation. The visible light frequency band ranges from 430 THz to 770 THz, which is about 400 times greater than the radio frequency bandwidth that ranges from 1 Hz to 3 THz. This makes it possible to transfer more data through the visible light bandwidth than the radio frequency bandwidth, resulting in a higher data transfer rate and faster speeds. Li-Fi is capable of transmitting any type of data that can be transferred using conventional Wi-Fi networks, such as images, audio, video, and internet connectivity, among others. However, Li-Fi offers several advantages over Wi- Fi networks, such as increased security, more connected devices, higher speed, and lower costs.In the coming years, we can expect a growing number of devices that support Li-Fi to hit the market. It is predicted that the Li-Fi market will experience a compound annual growth rate of 82% from 2015 to 2018 and will be worth over56 billion dollars per year by 2018.

II. RELATED WORKS

Transferring data can be simplified and made more secure with the use of LI-FI technology. Unlike traditional methods that depend on physical connections suchas wires, LI-FI employs laser light for data transfer. This makes it ideal for use insensitive environments such as hospitals or airplanes where electromagnetic interference can cause problems.

III.EXISTING METHOD

Li-Fi is a technology that uses visible light (VL) instead of radio frequency (RF)to transmit data. It offers a bandwidth that is 10,000 times larger than that of RFand can use existing lighting infrastructure such as streetlights, traffic lights, home or office lamps, and flat panel displays. The integration of Li-Fi is more accessible due to the fact that it utilizes the existing lighting infrastructure.

IV. PROPOSED SYSTEM

The entire circuit is set up as a common emitter mode amplifier. The three BC337are connected in parallel, with base-to-base terminals, collector-to-collector terminals, and emitter-to-emitter terminals. Two 1000uF input capacitors are also present, which only allow AC signals to enter the LI-FI circuit. Additionally, a 100 kilo ohm variable resistor is used to adjust the brightness of the LED. Finally,a 1-watt LED is utilized to transmit both the audio signal and light.

V. BLOCK DIAGRAM

The Li-Fi system is comprised of two main components: the transmitter and the receiver. The transmitter works by modulating the input signal with a specific time period and then transmitting the data using LED bulbs in the form of 0's and1's. The flashes of the LED bulbs represent the 0's and 1's. At the receiving end, a photodetector is used to receive the LED flashes, which strengthens the signal and produces the output.

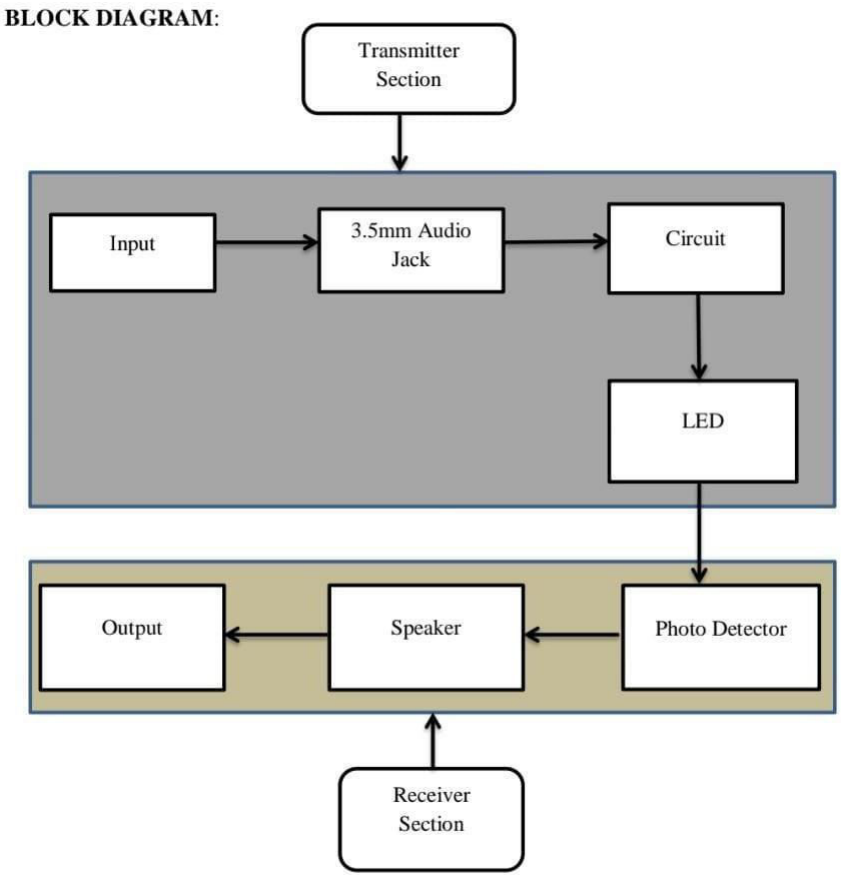

Fig No1:LI-FI BLOCK DIAGRAM

CIRCUIT DIAGRAM

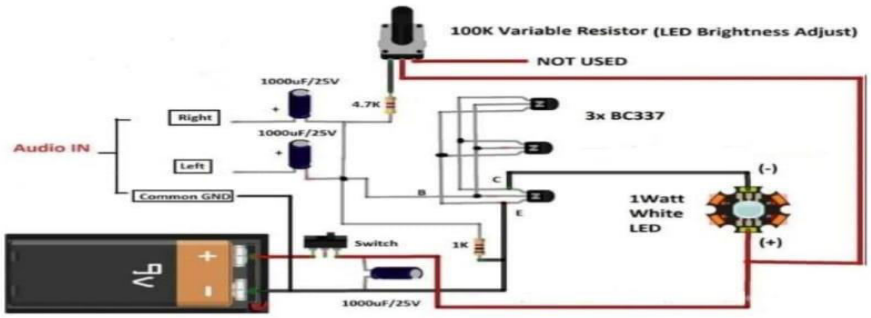

Fig No2:LI-FI CIRCUIT DIAGRAM

The Li-Fi system block diagram comprises a transmitter section that includes aninput, a timer circuit, and an LED bulb. The input can be any type of data, such as voice or text. The role of the timer is to provide the necessary time intervals between each bit, which is then transmitted to the receiver as a series of LED
flashes. These flashes are transmitted to the receiver end in the form of LEDflashes.

VI. EXPERIMENTAL RESULTS

In Li-Fi, transmission is unaffected by distance or angle for uploads anddownloads at various distances.

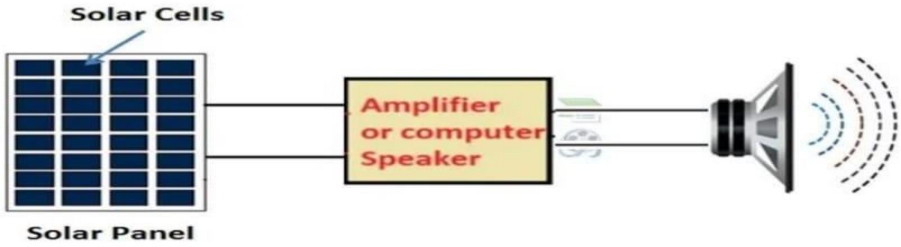

Fig No3: LI-FI SOLAR PANEL

OVERALL VIEW OF OUR PROJECT:

Li-Fi uses light waves to wirelessly transmit data, unlike Wi-Fi which usesradio signals. Therefore, distance positioning is different.

Fig No4:LI-FI EXPERIMENT RESULT

Thus, it works efficiently within the light source and the environment within the allowed radius, which prevents any unwanted users from sniffing the traffic andpackets being transmitted.

VII. FUTURE WORK

Li-Fi is an emerging technology with vast potential for research. A lot of scientists are already conducting extensive research in this field. The future of Li-Fi is Gi-Fi, which refers to wireless communication at a data rate of more than one billionbits (gigabit) per second. With Li-Fi, we can enjoy energy-saving parallelism. Inthe future, we can have an LED array placed beside a motorway that can help light the road, display the latest traffic updates, and transmit internet informationwirelessly to passengers' laptops, notebooks, and smartphones.

VIII. CONCLUSION

In this study, we provide an updated survey of LI-FI technology, which serves as a guideline for future research areas. LI-FI is a powerful green technology that addresses the limitations of current RF-based technologies such as WIFI. It uses visible light for information transmission. We have presented the main current research areas and guidelines for designing a LI-FI system or new applications. Additionally, we analyze advanced LI-FI projects from both academic and industrial sectors. We highlight LI-FI's advantages over its counterpart, WIFI, and propose challenges that still need to be addressed.
Finally, we discuss future directions and the expected timeline for thispromising technology in the coming years.

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