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Transmission of Data and Audio Signal Using Li-Fi Technology

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ABSTRACT: The light fidelity technology refers to visible light communication that uses light as a medium to deliver high speed data which is much greater than that of Wi-Fi. Li-Fi data is transmitted in several bit streams and the receiver side consist an IR detector decodes the message. The transmission happens in the form of binary data where 0 means LED is in OFF state and 1 means that the LED is in ON state. Transmitter and receiver sections contain Arduino which is programmed using Arduino IDE. High power intensity LED is used in the Li-Fi transmitter. In receiver section photodiode module is used to detect the light signal generated by the Li-Fi transmitter. This project having 2 kits, one kit for transferring audio signal and another kit for transmitting data signal using LI-FI technology. For audio transmission earphones, speaker, amplifier board, light and solar panel are used. For data transmission LI-FI transmitter and receiver are used.

KEYWORDS: Light fidelity, wireless fidelity, data transmission.

I. INTRODUCTION

Li-Fi technology uses LED for transmitting data. It is derivative of optical wireless communication technology using light from LED to deliver high speed communication. Visible light communication works by switching the LED OFF and ON at very high speed, it can't noticed by the human eye. The intensity of the Li-Fi LED emitter is kept low enough so that it cannot be seen by the human eye but high enough to carry out the communication easily. It is also very secure from hacking as the light cannot penetrate the walls. However, this also limits the range. This is advantageous in electromagnetic sensitive areas where electromagnetic interference is especially avoided like hospitals, nuclear power plants and aircrafts. Although Wi-Fi and Li-Fi both employ electromagnetic spectrum to transmit information, Wi-Fi uses radio waves and Li-Fi uses visible light. Li-Fi has almost no limitations on capacity. Visible light spectrum is 10,000 times larger than the entire radio frequency spectrum. The light signals are transmitted via wireless channels to the receiver. The detector in the receiver converts the optical signals to recover the message. Since light cannot travel through the walls, hence Li-Fi signals can be secured in physical space.

An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, sometimes with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of them Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

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Physically embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure

II. LITERATURE SURVEY

[1] **Rekha R, Priyadarshini C, Pooja R** proposes that Li-Fi is one of the wireless technologies which uses visible light for communication. Li-Fi has achieved remarkable success in every field of communication as it uses visible light which has high speed, more security and less interference due to which large capacity wireless data transmission is possible. The objective of this paper is to transmit text (Hexadecimal characters) and Audio information using light as carrier. The high flickering LED and LASER is used as a source to transmit text data and audio respectively. Li-Fi module for transmitting and receiving the text data and audio is built and tested successfully. It is possible to achieve text data transmission of up to 2m by using LDR as the detector. Audio transmission of around 15 feet using solar panel in the receiver side.

[2] **Nikshep K.N, Sowmyan G** demonstrates that Over the years, the overdependence on Wireless Fidelity (Wi-Fi) for data transmission necessitated the need for an alternate and more reliable means of communication, hence, Light Fidelity (Li-Fi). It involves the use of Light Emitting Diode to transmit data by blinking (i.e. switching them ON and OFF at a speed not noticeable to the eye. This paper proposed the development of the Li-Fi system using off the shelf electronic components. The proposed system utilizes an embedded system with dual-core Advanced Virtual RISC (AVR) microcontroller (ATmega16L) interfaced to input/output circuits comprising of the Light Emitting Diode (LED), LM358N Operational Amplifier and a photodiode. Also, by developing a user (Receiver PC) interface using Embedded C programming, the sample data (text, voice and image) transferred was monitored and the speed, efficiency, security and capacity of the system was examined and discovered to be top notch. This would make the system an indispensable means of communication in the nearest future. This data transmission system is different from those in existence because expensive components were not in the design, invariably reducing the overall cost of the implementation.

Li-Fi is a new technique of data transmission. LI-FI data is transmitted by modulating the intensity of the light, which is then received by a photo detector. VLC (Visible Light Communication) technology consists of a light source as a transmitter and photo detector as receiver. In transmitter the electrical signals are converted into optic signals and transmitted through LED. The receiver contains photo detector. The photo detector converts the optic signal into electrical signal. This method is made sophisticated by using more than one led at a given time. By this way more information can be passed and hence a faster data communication is possible.

III. PROPOSED SYSTEM

Previously we were transmitting data using WI-FI. In today world, communication between the devices is much common. These devices are using radio waves for short range wireless transmissions. Wi-Fi and Bluetooth are currently the two prominent short range wireless technologies. The radio wave spectrum has certain key limitations which include bandwidth consumption, efficiency, availability and security. We were transmitting data using WI-FI but LI-FI is more convenient and faster. It takes more time to transmit the data.

To overcome this drawback, introducing this project transmission of data and audio signal using LI-FI. Here two kits are used for transferring audio signal and data using LIFI. For audio transmission earphones, speaker, amplifier board, solar panel and light are used. Earphones are connected to the system and it is connected to solar panel when song is played on our system and light is placed on solar panel it will send that signal to amplifier circuit and it will amplify that signal and give it to speaker. For data transmission LI-FI transmitter and receiver are used .If anything is writing on monitor it will transmit from LI-FI transmitter and receiver side will receive that data and show it on monitor.

IV. WORKING PRINCIPLE

Two kits are used for transmission of data and audio signal using LI-FI technology. One kit for transferring data signal and another kit for transmitting audio signal. For audio transmission earphones, speaker, amplifier board, and solar panel, and light are used. Here we will connect earphone to the system and it is connected to solar panel whenever playing song on system and if light is placed on solar panel it will send that signal to amplifier circuit and it will amplify that signal and give it to speaker. For data transmission LI-FI transmitter and receiver are used. If anything is written on monitor it will transmit from LI-FI transmitter and receiver side will receive that data and show it on monitor.

V. RESULTS

Trans-reception of the audio and text files is successfully implemented using visible light as the carrier. The following observations are made.

- As the distance between the transmitter and receiver increases, the received signal quality decreases.
- The experimental result defines that maximum distance achieved in visible light communication system is approximately 2m for data transmission and around 15ft for audio transmission.
- The received data is affected if the angle between the receiver and LOS of the LED changes.

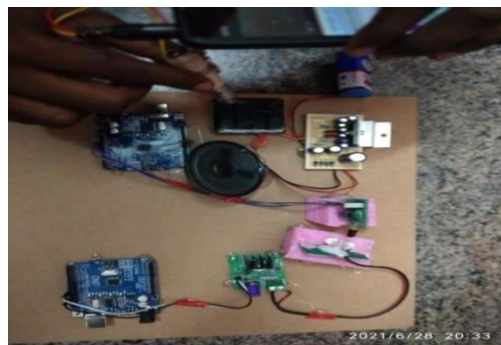


Fig 1: Audio Transmission

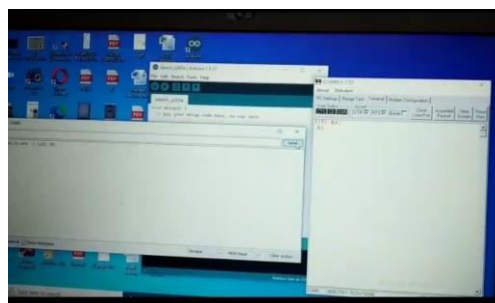


Fig 2: Data Transmission

VI. CONCLUSION

LI-FI technology can transmit data with the speed of 100gbps approximately which is entirely greater than radio waves. Li-Fi is categorized as reliable communication technique as it provides high data security transmission with low cost. Adding the high intensity LEDs or focusing lens to increase the range of communication. Output disturbance can be reduced by adding the noise termination circuit at the receiver end.

In future, this work can be enhanced by Adding the high intensity LEDs or focusing lens to increase the range of communication. Output disturbance can be reduced by adding the noise termination circuit at the receiver end.



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