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LI-FI TECHNOLOGY

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***Abstract*-**The main purpose of this thesis is to discuss about LI-FI TECHNOLOGY. Light-emitting diodes, or LEDs, are utilized in a wide variety of applications because they are inexpensive, long-lasting, and sturdy. Indeed, many people anticipate that LED light bulbs will eventually replace all incandescent and compact fluorescent light bulbs in applications requiring broad lighting. For some time, it has been known that the LEDs employed in these systems may be adjusted simultaneously for use in both signal generation and signal receiving. Visible light communications (VLC) may be utilized for a number of applications, including intelligent transportation system location through wireless sensor networks, in-flight data downlinks via aircraft reading lights, and interior LANs via ambient lighting. We built a working prototype of a LIFI system capable of transmitting files and data. The goal of this project is to use a

VLC media player and a UART serial connection to transmit information and files from one computer to another. As a result, we installed photodiodes in the computer at the receiving end of the visible light communication system to pick up signals sent from the sending end. We used a PIC microcontroller to flip the LED at the transmitting end, converting the incoming stream of binary data into a file that the PC application could read. This will enable the program to read the file.

Keywords— *Li-Fi technology, visible light communication, RF communication, electromagnetic spectrum, light fidelity, orthogonal frequency-division multiplexing, effective transmission.*

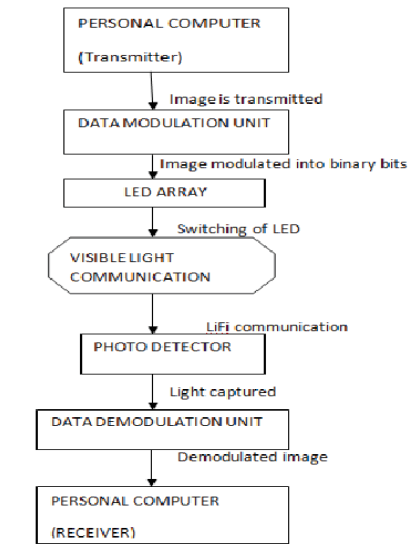
I. INTRODUCTION

The main aim of this thesis is to discuss about LI-FI TECHNOLOGY. The conveyance of information from one area to another is a necessary component of contemporary living. When multiple devices are linked to the present wireless networks that connect us to the internet, they become unbearably slow. As the number of devices that can connect to the internet grows, it becomes increasingly challenging to connect to a secure network while maintaining fast data transfer speeds. However, in its present condition, only a small section of the electromagnetic spectrum can be exploited for data transmission. One approach to addressing this problem is to use Li-Fi as a solution. In its shortened version, "Light-Quality" technology is known to as "Li-Fi." The name "Li-Fi" refers to a technique of carrying data by light that does away with the requirement for a physical fiber in a fiber optic connection and instead transfers data via an LED light bulb whose brightness changes faster than the human eye can follow. A physical fiber in a fiber optic cable is no longer required. Li-Fi The phrase "optical equivalent of Wi-Fi," or optical Ethernet, is commonly used. The term "Li-Fi" refers to a low-cost and rapid wireless communication technology, and it is used to describe the technology. Light, rather than radio waves running at gigahertz frequencies, is employed in the data transmission process while employing Li-Fi. Because Li-Fi uses previously unused visible light bandwidth in addition to the already existing radio waves for data transmission, it has the potential to play a significant role in reducing the massive pressure imposed on the majority of wireless networks now in use. This suggests that it gives access to a far larger frequency range (300 THz) than RF communication (300GHz). Concerns that the radiation released by wireless internet may be harmful to human health should be relieved by the advent of new data related to the visible portion of the electromagnetic spectrum.

II. LITERATURE REVIEW

According to Karthika & Balakrishnan, (2015), The term "visible light communication" (VLC) refers to a kind of optical wireless communication that uses visible light to transport data, and the abbreviation stands for "visible light communication." The two-way communication that occurs via the use of light is known as "light fidelity," or "Li-Fi."
The framework for this kind of system has already been set, and light may serve dual functions here by supplying both illumination and communication. In the research, we investigate the usage of VLC as Li-Fi, which is a secure method of wireless data transport that is more secure than the standard Wi-Fi architecture (Kirrbach et al., 2019).

Flow chart for LiFi image transmissio



Finally, we investigate the usefulness of orthogonal frequency-division multiplexing (OFDM) as a modulation format for high data transfer in a very low-latency (VLC) network. This is done in order to increase the network's efficiency (OFDM). As per Sarkar et al., (2015), Data can only be transferred via Li-Fi by shining a light on it. The data is delivered through an LED light bulb whose brightness swings at a rate faster than the human eye can follow. The authors of this study will do comprehensive research on Li-Fi to discover if and how it may replace Wi-Fi (Mugunthan, 2020). When it comes to providing dense wireless data coverage in small, unobstructed areas, Li-Fi outperforms Wi-Fi. Wi-Fi is ideal for providing wireless access in large interior environments. Light-fidelity, often known as Li-Fi, is a kind of wireless optical networking technology that uses light-emitting diodes to transport data (LEDs). The data transmission capabilities of Li-Fi, like those of Wi-Fi, are enabled by technology connected with visible light communication (VLC). When compared to Wi-Fi, Li-Fi has higher capabilities in terms of bandwidth, efficiency, availability, and security. Li-Fi has already achieved high laboratory speeds. This article will give a thorough examination of the Li-Fi technology, emphasizing its advantages as well as the applications that may be created for it in the near future (Kulkarni et al., 2017).

III. METHODOLOGY

Depending on the data collected, research methodologies may be classed as either qualitative or quantitative. Every strategy improves data collection, processing, and presentation in some way, which helps the researcher achieve the study's goals. There are three major aspects to keep in mind while creating a research strategy. Wi-Fi is becoming more popular across the world, including in Ukraine, notably for usage in private networks. Some disadvantages of utilizing it include its slowness, lack of privacy, and the possibility of channel interference. As a consequence, the Li-Fi network is currently being examined as a flexible option capable of meeting the rising needs of private wireless internet access networks. By using the current LED-based lighting infrastructure, the revolutionary technology under consideration not only achieves high data rates and electromagnetic compatibility, but it also provides excellent economic performance. A model for the interaction of the different components of a corporate Li-Fi network is built and provided in this study. The research focuses mostly on the construction and operation of the network. The basic components of mobile-to-mobile contact have been investigated. We provide a demonstration of how to calculate the power wasted via the optical paths of a Li-Fi system. In addition, the direct light signal to diffuse light signal ratio was computed. According to the results of this study, a new kind of data transmission network might be created for use in radio-wave-sensitive environments such as airplanes and operating rooms. The findings might also be used in the corporate world to help with the building of an optical network, determining its characteristics, and assessing the load on such a network in light of the supply of cutting-edge services to customers. All of these things are possible with the aid of the outcomes. The primary purpose of this research is to expand the amount of area that current Li-Fi technology can cover. As a result, the study topic lends itself nicely to either applied research or action research. It has been suggested that concave mirrors be used to widen the scope and angle of the visible light spectrum. As a result, we must have a basic grasp of electromagnetic waves, as well as the properties of light, mirrors, and lenses. The question of how to expand the range of Li-Fi networks' coverage has yet to be answered. We will provide a different strategy as an option. We propose including a concave mirror into the system, which might reduce the overall number of LEDs while simultaneously increasing the operating range of the LEDs.

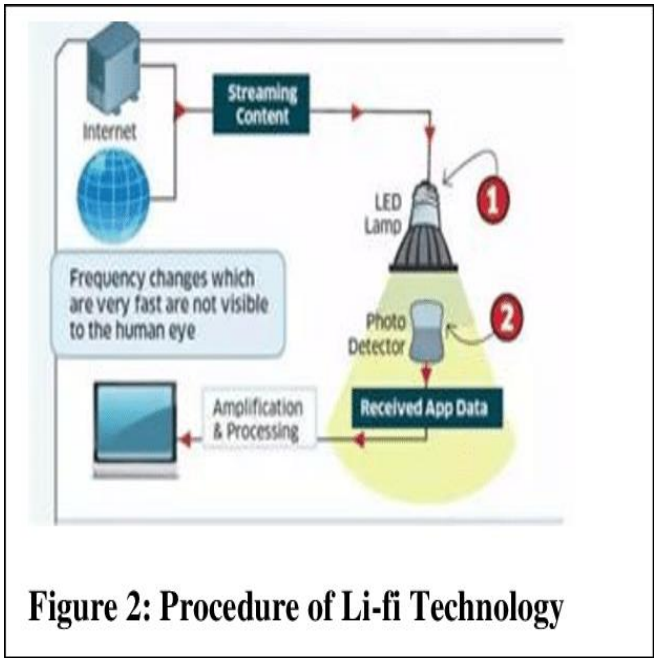


Figure 2: Procedure of Li-fi Technology

IV. RESULTS AND DISCUSSION

Unlike Wi-Fi, which delivers data through radio transmissions, Li-data-transmission Fi's technology is based on the utilization of light waves. As a result, it is effective within the light source's permissible environs, where it prevents unwanted users from listening in on transmitted data and packets. On the other side, the capabilities of Wi-long-distance Fi undermine security since they let third parties to listen in on data transfers and maybe perform man-in-the-middle attacks. Because light waves can only travel in a straight line, Li-Fi is also made up of a focused beam of light. This is due to the physical properties of light waves. As a result of this, businesses may employ VLC to increase privacy in highly secure networked zones. For example, the network managed by the department of information technology employs Li-Fi technology, which significantly improves data security while in transit. Because light waves cannot penetrate through objects such as walls, the ability of Li-Fi networks to cross obstacles is severely limited. Li-Fi is a highly concentrated technology that requires exact alignment of the light to the receiver in order to achieve effective transmission. This feature of technology increases the technology's security.

V. RECOMMEDETIONS AND LIMITATION

- Passengers aboard aircraft may have to pay an arm and a leg to connect to the internet at a modest pace. Wi-Fi is also not utilized since it has the potential to interfere with the pilots' navigational systems.

- It is possible that in the future, data communications aboard aircraft will employ Li-Fi. A Li-Fi system inside an airplane may simply offer high-speed Internet connectivity by using any existing source of light, such as overhead reading lights, for example.

- Li-Fi might possibly be used to keep people connected in the aftermath of natural catastrophes like as earthquakes or hurricanes. It's probable that the average individual wouldn't know what to do in a crisis.

- Unlike standard Wi-Fi, which may struggle to work in underground locations such as subway tunnels and stations, Li-Fi has no such limitations. Furthermore, during normal business hours, Li-Fi lights may

provide low-cost, high-speed Internet access on every corner.

- Because light cannot pass through substance, if the receiver is ever mistakenly hindered in any way, the connection will be lost. This might happen for a variety of reasons. If the light signal is not received, there is always the option of switching to the radio signal.

- It is critical for organizations who supply VLC services to prioritize network coverage and reliability above anything else. Transparent objects in the transmission path, as well as external light sources such as the sun or incandescent light bulbs, have the potential to interfere with and disrupt transmissions.

- Despite the fact that implementing this technology would result in cost savings for recurrent expenditures such as power charges, maintenance fees, and so on, the widespread deployment of VLC may contribute to the high initial pricing of the systems.

CONCLUSION

When it comes to data transmission, the study's results show that typical Wi-Fi design cannot compete with the degree of safety and reliability provided by Li-Fi networks. As a result, we ran experiments to assess how secure both Wi-Fi and Li-Fi are. Because light waves cannot penetrate through opaque materials, Li-Fi is much more secure than Wi-Fi, which may be compromised in a number of ways (including data leaking and session hijacking). We were able to show the high data rate and low BER of Li-Fi via simulation. Furthermore, Li-Fi makes use of a nearly infinite bandwidth as well as an unlicensed light-wave spectrum. As a consequence, Li-Fi can serve a large number of devices at the same time while maintaining a high data throughput. Closing the door is a catch-all phrase that may be used to describe all of these elements of low-security F's.

REFERENCES

- Karthika, R., & Balakrishnan, S. (2015). Wireless communication using Li-Fi technology. SSRG International Journal of Electronics and Communication Engineering (SSRG-IJECE), 2(3), 32-40.
- Sarkar, A., Agarwal, S., & Nath, A. (2015). Li-Fi technology: data transmission through visible light. International Journal of Advance Research in Computer Science and Management Studies, 3(6).
- Kirrbach, R., Jakob, B., & Noack, A. (2019, February). Introducing Advanced Freeform Optic Design to Li-Fi Technology. In PHOTOPTICS (pp. 248-254).
- Kulkarni, S., Darekar, A., & Shirol, S. (2017, December). Proposed framework for V2V communication using Li-Fi technology. In 2017 International Conference on Circuits, Controls, and Communications (CCUBE) (pp. 187-190). IEEE.
- Mugunthan, S. R. (2020). Concept of Li-Fi on smart communication between vehicles and traffic signals. Journal: Journal of Ubiquitous Computing and Communication Technologies, 2, 59-69.