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Li-Fi Technology

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ABSTRACT: Li-Fi stands for Light Fidelity. This technology is very new and was designed by the German physicist Harald Haas at 2011 TED (Technology, Entertainment, Design) Global Talk about Visible Light Communication (VLC).
Li-Fi is a wireless optical network technology that uses light emitting diodes (LEDs) for data transmission. Li-Fi term refers to visible light communication (VLC) technology that uses light as a medium provide high-speed communications in a manner similar to Wi-Fi and is compliant with IEEE standard IEEE 802.15.7. IEEE 802.15.7 is high-speed, bidirectional, and fully a standard based on a network wireless communication technology similar to Wi-Fi IEEE 802.11.

This article focuses on Li-Fi, its applications, features and comparison with existing ones technologies like Wi-Fi etc. Wi-Fi has a major use for general indoor wireless coverage building, while Li-Fi is ideal for high-density wireless data coverage in limited space and particularly useful for applications in areas where radio interference is a problem concerns, so the two technologies can be considered complementary. Li-Fi provides better bandwidth, efficiency, connectivity and security than Wi-Fi and has already achieved high speeds of more than 1 Gbps in laboratory conditions. According to there are many opportunities to take advantage of the low cost nature of LEDs and lighting units use this medium. Li-Fi is the transmission of data through light by removing the fiber fiber optics and sending data using an LED bulb.

I. INTRODUCTION

In the era of overcrowded world (data communication), Li-Fi is a new way of wireless connection communication that uses LED lights to transmit data wirelessly. Data transfer is one of the the most important daily activities in a fast-growing world. Current wireless the networks that connect us to the internet are very slow when multiple devices are connected.Also, as the number of devices accessing the Internet increases, so does availability with fixed bandwidth it is much more difficult to take advantage of high data transfer speeds and connections secure network. Radio waves are only a small part of the available electromagnetic spectrum for data transfer. Li-Fi has a much wider spectrum for transmission compared to conventional wireless communication methods that rely on radio waves. Basic ideology behind this technology is that data can be transmitted through LED light by changing the light intensities faster than human eyes can perceive. This technology uses part the electromagnetic spectrum, which is still underutilized - instead of the visible spectrum Gigahertz radio waves for data transmission.

The idea of Li-Fi was first introduced by the German physicist Harald Hass in TED (Technology, Entertainment, Design) Global talk on Visible Light Communication (VLC) in July 2011, by referring to it as "data through illumination". He used a table lamp with An LED bulb to transmit a video of a blooming flower, which was then projected onto a screen. In Simply put, Li-Fi can be thought of as light-based Wi-Fi, i.e. it uses light waves instead radio waves for data transmission. Instead of Wi-Fi modems, Li-Fi would use LED-equipped transceivers lamps that could illuminate a room as well as transmit and receive information. By adding new a of unused visible light bandwidth to currently available radio waves for data transmission, LiFi can play a major role in alleviating the heavy load that current wireless systems face. It can therefore offer an additional frequency band in the order of 400 THz compared to the available one in RF communication which is about 300 GHz. Li-Fi also uses the visible spectrum will help alleviate concerns that the electromagnetic waves that come with Wi-Fi could adversely affect our health.

By communicating through visible light, Li-Fi technology has the potential to change the way we can access the internet, stream videos, receive emails and much more. There would be no security problem because data cannot be accessed in the absence of light. As Result, it can be used in high security military areas where RF communications are susceptible to eavesdropping.

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II. LITERATURE REVIEW

Using a standard LED with white light, scientists from The Heinrich Hertz Institute in Berlin, Germany achieved data rates over 500 megabytes per second. Li-Fi The consortium was formed in October 2011 by the group companies and industry groups to promote high speed optical wireless systems and overcome the limited amount radio wireless spectrum. According to Li-Fi Consortium can reach more than 10 Gbps a speed that would theoretically allow high-definition film downloadable in just 30 seconds. Researchers at The University of Strathclyde in Scotland started the task bringing high-speed, ubiquitous Li- Fi technology to market WANG Jia-Yuan, ZOU Nian-Yu, WANG Dong, IRIEKentaro, IHA Zensei, NAMIHIRA Yoshinori .The Journal of China University of Post and Telecommunications. In this paper reception area lighting for various the distance between the LED and the photodiode receiver was tested. It was found that with the increase in communication distance, the illumination decreased sharply.

The technology is a fast and cheap optical version of Wi-Fi. It is based on visible light communication. VLC is a data communication medium using visible light between 400 THz to 375 THz as an optical carrier for data transmission and illumination. The data is encoded in the light to generate a new data stream by changing the blink rate to make it brighter by modulating the LED light communication source. This is a whole new spectrum of possibilities compared to the radio wave spectrum and is 10,000 times larger. Visible light does not damage eyesight and is a mandatory part of the infrastructure, therefore it is abundantly available and easily accessible. When comparing the number of radio cellular base stations (1.4 million) to the number of light bulbs already installed (14 billion), the ratio happens to be the same, i.e. 1:10000 6. Modulation Techniques for VLC & Li Researchers have developed a new digital modulation technique which can be used in optical wireless communication using LEDs. technique, it will depend on the change in light intensity, but the information varied. A force can be strictly positive.

Objectives:-
1. Increasing bandwidth availability:
One of the primary goals of LiFi is to increase the available bandwidth for data transmission. The visible light spectrum is significantly larger than the radio frequency spectrum, providing a huge untapped resource for high-speed data communications.

2. Increasing the speed of data transfer:
LiFi technology aims to achieve significantly higher data transfer speeds compared to regular WiFi. With advanced modulation techniques and optimized hardware components, LiFi systems can support data rates of several gigabits per second (Gbps), enabling faster and more efficient data transfer.

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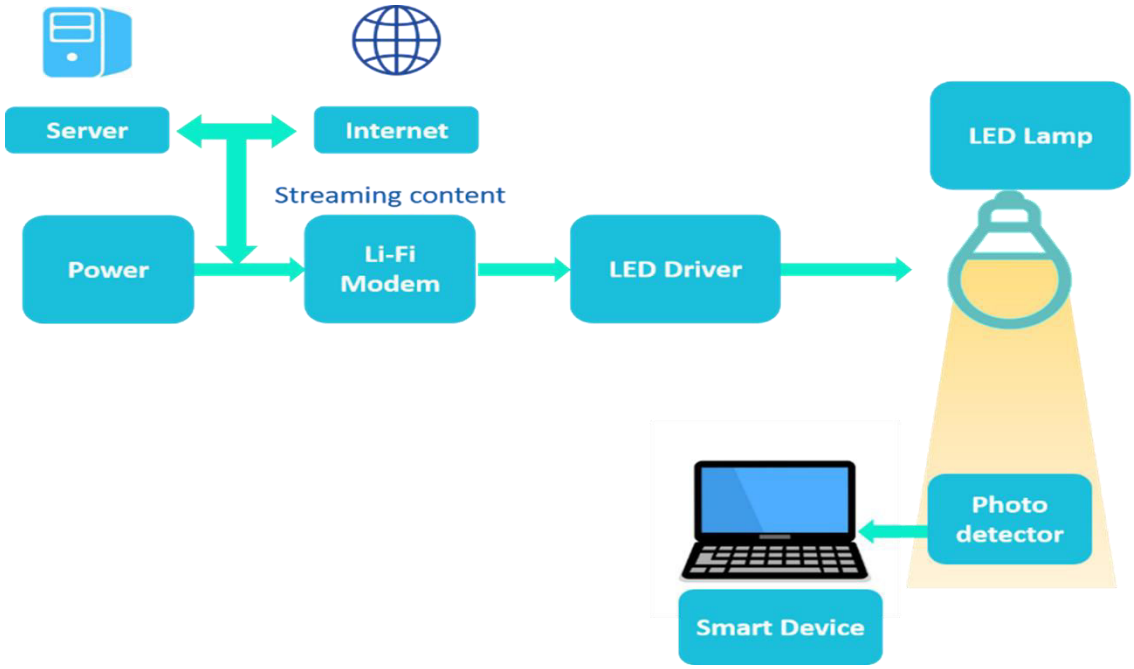
3. Improving data security:
LiFi offers inherent security benefits due to the propagating nature of light. Visible light does not penetrate walls, making LiFi signals better contained and reducing the risk of unauthorized access and eavesdropping. This objective is particularly important for environments where data security is critical, such as the government, military and corporate sectors.

4. Reduction of electromagnetic interference:
LiFi technology aims to provide solutions for environments sensitive to electromagnetic interference, such as hospitals, aircraft and industrial facilities.

III. RESEARCH METHODOLOGY

Working with Li-Fi is very simple. At one end is a light emitter, i.e. an LED transmitter, and a photodetector (light sensor) on the other. The data input to the LED transmitter is coded into light (technically referred to as visible light communication) by changing the blinking the rate at which the LEDs flash "on" and "off" to generate different strings of 1s and 0s. LED transmitter power-on activity that appears to be invisible (LED intensity is modulated so fast that the human eye does not notice it, so the LED light appears constant to people) allows data to be transmitted in a lightweight form in accordance with incoming binary codes: switching The LED on is logic '1', its off is logic '0'. By changing the rate which LEDs flash on and off, information can be coded in the light into different combinations 1s and 0s.

In a typical setup, the transmitter (LED) is connected to a data network (internet via modem) and receiver (photo detector/light sensor) on the receiving side receives the data as light signal and decodes the information which is then displayed on the connected device recipient. The receiver (photodetector) registers a binary "1" when the emitter (LED).
ON and binary "0" when transmitter (LED) is off. The LED will then flash several times or using an array of LEDs (perhaps several different colors) will ultimately provide the transfer rate in the order of hundreds of Mbps.



IV.OBJECTIVE

- The main objective of the technology is to provide an efficient, low-cost, secure, digitally controlled and fast data transmission technique that can be used as
- an alternative for the conventional WiFi data transfer technique.
- At the same time, the project also allows us to use a more efficient light source, i.e. LED.

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- Technology also focuses on a communication tool in public places that brings faster data transfer over a wide spectrum.

V. LIMITATIONS & FUTURE SCOPE

Limitations-:

- Without a light source, there is no access to the Internet.
- This could limit the locations and situations in which Li-Fi could be used.
- Data transmission requires close or perfect visibility.
- Opaque road obstacles can affect data transmission.
- Natural light, sunlight and ordinary electric light can affect data transmission speed.
- Light waves do not pass through walls, so Li -Fi has a much shorter range than Wi-Fi.
- High initial installation costs if used to set up a full data network.
- It will still be developed for mass adoption.

Future Scope:-

a) Airlines:

Whenever we travel through airways, we face a problem in communication media because all airway communication is based on radio waves. To overcome this disadvantage on radio paths, li-fi can be introduced.

b) You may live longer:

Healthcare technology has lagged behind the rest of the wireless world for a long time. Operating theaters do not allow Wi-Fi due to radiation concerns, and the lack of computers can also block signals from monitoring equipment. Li-Fi solves both problems: lights are only allowed in operating theatres.

c) Increase communication security:

Visual light communication makes a node or any terminal connected to our network visible to the network host.

d) Communication with multiple users:

Li-Fi supports network broadcast, it helps to share multiple things in one instance called broadcast.

VI. CONCLUSIONS

While there is still a long way to go for this technology to achieve commercial success, it is promises great potential in the field of wireless Internet. A significant number of researchers and companies are currently working on this concept, which promises to solve the problem lack of radio spectrum, space and low internet connection speed. By deploying this
technology, we can move to greener, cleaner and safer communication networks. Very the Li-Fi concept promises to solve problems such as lack of radio bandwidth and eliminates the disadvantages of radio communication technologies. Li-Fi is an upcoming a growing technology acting as a catalyst for various other development and new inventions/technology. So there is a certainty of future application development Li-Fi that can be extended to different platforms and different areas of human life.

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