

LIFI BASED TEXT COMMUNICATION BETWEEN TWO AURDINO

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Structured Abstract-

Purpose: LIFI The internet at the speed of the light. LIFI technology it allows us to connect to the internet using light from the lamps, streetlights or LED televisions.

Methodology: Light Fidelity is a wireless communication system based on use the visible light between violet and red. Li-Fi uses the optical spectrum i.e. Visible light part of electromagnetic spectrum

Objective: The main objective of this project is to design and construct a data transmission system that transmits text data effectively using li-fi technology.

Findings: High volume of data can be transmitted at extremely high speed.

Practical implications: Li-Fi could be used in certain places sensitive to electromagnetic areas such as airplanes or hospitals.

Social implications: Li-Fi could be used in Traffic Management and disaster management.

Originality/Value: LI-FI Technology is cheaper and environmental friendly.

Abstract –

In this era of advanced science, a number of wireless connections are available to connect to the internet. It has become every common and handy tool to access wireless internet from a coffee shop to a conference hall. As the number of people accessing the wireless internet increase, the clogged airwaves make it extremely difficult to latch on to a reliable signal. One German physicist Harald Hass has come up with a solution which he names as “data through illumination” taking the fibre out of fibre optics by sending data through LED light bulb that varies in intensity faster than a human eye can identify. This technology is named as Li-Fi transmission which stands for light fidelity. This invention can produce data rates faster than 10 megabits per second which is much more than that of an average broadband connection speed. **Li-Fi** is a label for wireless-communication systems using light as a carrier instead of traditional radio frequencies, as in Wi-Fi. Li-Fi should not be confused with the more general term visible light communications (VLC), which is the use of the visible light portion of the electromagnetic spectrum to transmit information.

Introduction:



Li-Fi (Light Fidelity) is a high speed, wireless communication using visible light. It falls under the category of optical wireless communications. Data transmission takes place through LED (Light

Emitting Diode) bulbs whose intensity varies. Based on this variation, communication occurs digitally. This technology has broad applications where the use of Wi-Fi (Wireless Fidelity) is limited or banned. It also takes out the adverse health effects of using electromagnetic waves. Unless the light is seen, data cannot be hacked, and so data transmission is secure. Data transmission is typically in terms of Gigabytes per second.

The usage of light as a means to transmit data has been coined Li-Fi (Light - Fidelity) by Harald Hass at the University of Edinburgh[2]. The high-speed communication technology is similar to Wi-Fi but is faster, 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 Internet gain access to more areas and could revolutionize the telecoms industry.

Recently, wireless technology has bloomed to a great extent where we require wireless technology to transmit many data every day. Nowadays, wireless communications have become important in the communication process. The primary way of wireless data transmission is by using electromagnetic waves, i.e., radio waves. However, radio waves can support less bandwidth because of compact spectrum availability and intrusion. Solution to this is data transmission using Visible Light Communication (VLC)[1].

Wi-Fi deals with wireless coverage within premises, whereas Li-Fi is perfect for high compactness wireless data coverage in a defined area and for mitigating radio interference issues. Li-Fi focuses on transmitting multimedia data between two terminals using LEDs

Communication between two terminals in the 21st century is vital and occurs every day. Li-Fi plays an essential role in communication as discussed earlier which uses light for data transmission rather than radio waves used in wireless communication. The velocity of data transmission was about 10Mbps, though it is aimed to improve up to 100 Mbps by 2022 [3]. Li-Fi can be achieved by fitting a small microchip to every 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 these days would be solved. Thus, in the future, there would not be only 14 billion light bulbs, but 14 billion Li-Fi APs (Access Points) deployed worldwide -- for a cleaner, a greener and even brighter future.

LITERATURE SURVEY

Li-Fi known as light fidelity was introduced first time by Prof. Harald Haas on July 2011 at TED Global Talk. Li-Fi is based on Visual Light Communication (VLC) that using light emitting diodes (LEDs) to fully networked wireless system [1]. Li-Fi enables the electronic device to connect to the internet with no wire. In order to make a communication line between node, a Li-Fi will need a transceiver to transmit and receive the data. This transceiver will have a modulation technique to make the LED enable to carry the data using the light. The emergence of Li-Fi is to overcome the shortage of the current technology. We all know that right now Wi-Fi is the most used technology to connect many devices to the internet. As time comes by, the use of internet based devices is increased. This increasing made the capacity of Wi-Fi is reduced due the limitation of radio frequency resources.

According to [2], Li-Fi and Wi-Fi has the difference related to the congestion, density, security, safety, and speed.

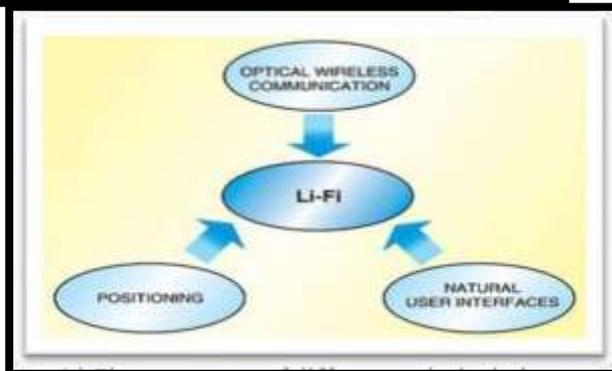
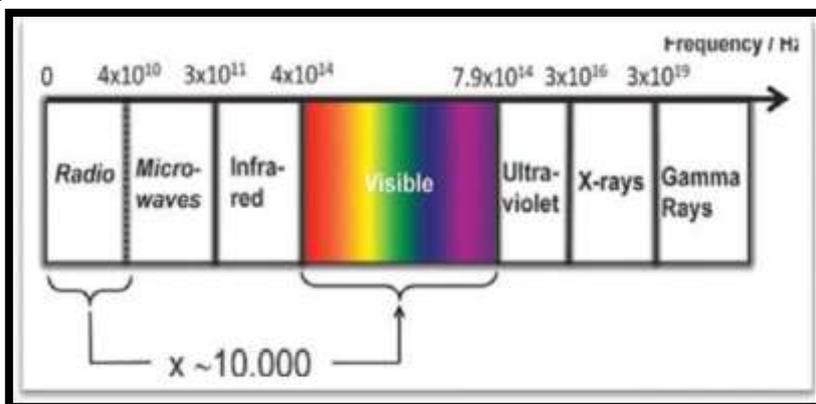
The more Wi-Fi enabled device is exist, the congestion may occur. In the technology of Wi-Fi we can't add more routers if the user is increased, while we can add the light in Li-Fi. Efficiency and safety of the internet are the dominating issues right now.

The performance of Li-Fi is claimed that more better than the performance of Wi-Fi. The rate speed of Li-Fi is 1000 times faster than Wi-Fi [2]. For safety of the internet, Li-Fi is more secure than the Wi-Fi based. The performance of Li-Fi is claimed that more better than the performance of Wi-Fi. The rate speed of Li-Fi is 1000 times faster than Wi-Fi [2]. For safety of the internet, Li-Fi is more secure than the Wi-Fi based on the spread of the signal. Li-Fi has a light characteristic that light

cannot go through the wall. It is different from the signal of Wi-Fi can go through anywhere. Based on those two technologies, in a simple conclusion is Li-Fi has more secure communication rather than the Wi-Fi. The vulnerability exists if there are leakage in the wall while having an indoor communication. Security threat that may exist is an intruder can spoof the data using the leakage wall. The most of the people are using Wi-Fi Internet devices, which will be useful for 2.4- 5GHz RF to deliver wireless Internet access surrounded our home, offices, schools, and some public places also. We are quite dependent upon these nearly ubiquitous services. While Wi-Fi can cover an entire house, school, the bandwidth is limited to 50-100 megabits per seconds (Mbps). It is a most current Internet service, but insufficient for moving large data files like HDTV movies, music libraries and video games. The most of the dependent upon 'the cloud' or our own 'media services' to store all of our files, including movies, photos, audio and video devices, games, the more and most bandwidth and speed should be needed to access this data. Therefore RF-based technologies such as today's Wi-Fi are not the optimal way. In addition, Wi-Fi may not be the most efficient way to provide new desired capabilities such as precision indoor positioning and gesture recognition. The optical wireless technologies, sometimes called visible light communication (VLC), and more recently referred to as Li-Fi

On the other hand, offer an entirely new paradigm in wireless technologies in the terms of communication speed, usability and flexibility, reliability. VLC is the possible solution to the global wireless spectrum shortage. Li-Fi technology is a fast and cheap optical version of Wi-Fi. It is a based on Visible Light Communication . The VLC is a data communication medium using visible light between 400THz to 375THz as optical carrier for the data transmission and illumination. The data is encoded in the light.

Li-Fi as a superset of different optical wireless technology to generate new data stream by varying the to generate new data stream by varying the technology. This is a whole new spectrum of possibilities as compared to the radio waves spectrum and is 10000 times more in size. Visible light is not injurious to vision and are a mandatory part of a infrastructure, therefore abundantly The electromagnetic spectrum and the vast potential of unused, unregulated safe green visible part is accessible



COMPONENTS USED IN THIS SYSTEM:

Arduino Nano:

Arduino Nano is a small, complete and breadboard-friendly based on the Atmel Atmega 328P microcontroller. It offers the same specifications of the Arduino uno offers board but in a smaller form. It is used here to interface with the keypad, LCD, LED, photodiode in a serial manner. It works with a Mini-B cable instead of a standard one.



LED:

A Light Emitting Diode (LED) is a small device that emits light whenever electrical current passes through it. Different colours of LED can be used for the transmission of data



Photodiode receiver:

The photodiode receiver is a device that has the capability to detect lightwaves and convert that energy into electrical energy by the principle of the photoelectric effect. This way, binary data is obtained from light data.



LCD:

The LCD or Liquid Crystal Display is a flat panel type display consisting of millions of pixels. It is used to display output received from the microcontroller connected through various data pins.



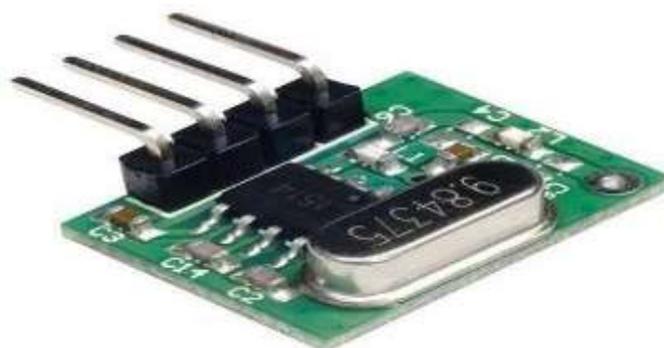
Transmitter module:

The transmitter module acts as an interface between the Arduino Nano microcontroller and the LED. It has various connections to both of them and also required a power supply.



Receiver module:

The receiver module is similar to the transmitter module as it acts as an interface between the photodiode sensor and the Arduino Nano microcontroller for processing purposes.

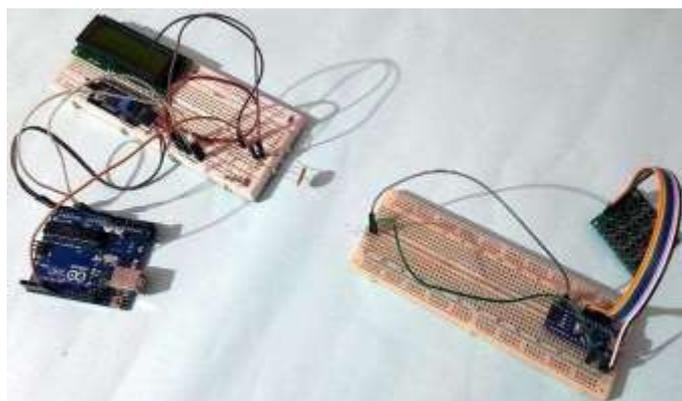


Arduino IDE:

Arduino IDE (Integrated Development Environment) software version 1.6.5/1.8.5 is used to code for making the microcontroller perform various operations and do the required processing of data.



HARDWARE SET UP OF THIS PROJECT



EXISTING METHODOLOGY

WIFI is a universal wireless networking technology that utilizes radio frequencies to transfer data. Wi-Fi allows high-speed Internet connections without the use of cables. The term Wi-Fi is a contraction of "wireless fidelity" and commonly used to refer to wireless networking technology. The Wi-Fi Alliance claims rights in its uses as a certification mark for equipment certified to 802.11x standards. Wi-Fi is a freedom – freedom from wires. It allows you to connect to the Internet from just about anywhere — a coffee shop, a hotel room, or a conference room at work. What's more – it is almost 10 times faster than a regular dial-up connection. Wi-Fi networks operate in the unlicensed 2.4 radio bands, with an 11 Mbps (802.11b) or 54 Mbps (802.11a) data rate, respectively. access Wi-Fi, you enabled devices (laptops or PDAs). These devices can send and receive data wirelessly in any location equipped with Wi-Fi access.

PROPOSED METHODOLOGY

In this methodology, Li-Fi is a new technology for short-range cellular communication system; which is well suited for data transmission via LEDs by illumination. Li-Fi uses the visible light, a part of the electromagnetic spectrum that remains to be not substantially utilized, rather than RF part [15]. Professor Harald Haas, the founder of Li-Fi technology, in his Technology Entertainment Design (TED) global talk on Li-Fi says: "At the cardiovascular system of this technology is a new generation an excellent source of high brightness LEDs." He also clarifies "Very simply, if the LED is on, you transmit a digital 1, if it's off you transmit a 0, they can be switched on and off very quickly, which gives nice opportunities for transmitted data. It will be possible to encode data in the light by varying the speed at which the LEDs glint on and off to give different strings of 1s and 0s. Figure 2.5.1 illustrates the concept of data transmission using light. The LED intensity is moderated so rapidly that the human eye cannot notice, so the output looks constant; also, techniques that are more complex could drastically increase Li-Fi data rates such as using an array of LEDs, where each LED transmits another type of data stream, to provide parallel data transmission. Other ideas are using mixtures of red, green and blue LEDs

Conclusion:

The use of Wi-Fi will increase largely by the next decade, which may be harmful to life due to the large dosage of radio waves. Therefore, Li-Fi technology can be used as an alternative for Wi-Fi as it is much safer in large doses and it increments on the capabilities of data transmission in Wi-Fi. This technology can be explored further in the future and if it is put into practical use, then every light bulb and light tube can be used as access to the internet.

Future Scope:

As light is everywhere and free to use, there is a great scope for the use and evolution of Li-Fi technology. If this technology matures, each Li-Fi Bulb can be used to transmit data. As the Li-Fi

technology becomes popular, it will lead to a cleaner, greener, economical, and safer communication system. Although Li-Fi promises to solve issues such as, shortage of radio-frequency bandwidth and eliminates the disadvantages of radio communication technologies, but it is also associated with short range and the need of a light source. As such Li-Fi is not likely to replace Wi-Fi completely, but the use of two together i.e. Wi-Fi and Li-Fi can prove to improve quality of life.

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