

An Enhance For Reliable High Speed Data Transmission using Li-Fi

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Abstract: Now days the Internet users are double in every year, so the load on radio frequencies is increased that's why the speed becomes very low and data transfer rate is also less it leads to congestion. To get the high speed, large bandwidth, greater efficiency, higher transmission rate Li-Fi system is evolved. Li-Fi (light-fidelity) system which is path to communicate between source sender and receiver. Li-Fi system works as Wi-Fi but instead of RF Li-Fi uses the light as medium. In Li-Fi data is transferred using LED light whose intensity is very faster. Data transfer using LEDs is 1000 times faster than the RF in Li-Fi, for the Communication medium is light and it uses only white LEDs. Data is transfer at the speed of light, Li-Fi use the concept of visible light communication to achieve high speed, security, one-directional and fully networked wireless communication.

I. INTRODUCTION

Now a days in the world of technology, data transfer is the most common and most used activity, data like text data audio video or any type of data which we want to transfer. Because of this large data access to internet slows down considerably as the number of devices connected to the same Wi-Fi increases, large amount of data we can't transfer with higher speed. And reasons for that is the fixed bandwidth, which restrict the data transfer rate. If we increased devices connected to the same network the data transfer rate would decrease. Li-Fi is the one of the solution for this problem because radio waves have a small spectrum available for data transfer than the light. Data transfer rate is 10 mbps can be produced with Li-Fi, which is faster than broadband connections. LED lights are also becoming popular and used in homes and also offices, hotels for its bright efficacy improvement. Li-Fi invented with increased bandwidth with better speed and security using visible lights as compared to electromagnetic waves used in Wi-Fi. Now days the demand for wireless data communication is increased and that's why the available radio spectrum has become insufficient (below 10GHz). So now Wireless communication industry has responded to increase radio spectrum (above 10 GHz). Li-Fi increase the trend towards the higher frequencies in the electromagnetic spectrum. Li-Fi consists of a complete wireless network system. In Li-Fi system LED acts like modem. LED are the key components in this system. In Li-Fi every LED light source act like access points (AP). Li-Fi is secure it not propagate through walls.

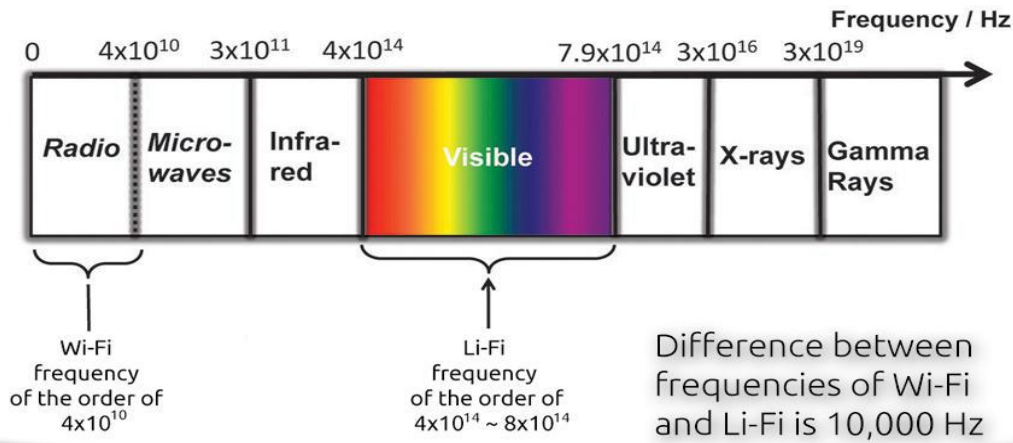
II. LITERATURE SURVEY:

Today we are using Wi-Fi internet devices, which is better for 2.4-5GHz RF to deliver wireless communications or access of internet in our homes, offices, school, and some other places also. While Wi-Fi is used in house, school, the rate or bandwidth is limited to 50-100 Mbps. It is mostly used internet services, but insufficient to large bandwidth files like music, libraries and videos, HDTV, movies to moving over internet. For storage purpose we are dependent upon the cloud system, and for the access this type of data the most bandwidth and speed should be needed, so Wi-Fi is not optimal way, so in Li-Fi the for optical wireless communication visible light communication (VLC) is referred.

Li-Fi technology is based on Visible light Communication and it provides fast, cheap and efficient optical version of Wi-Fi. The VLC is a medium for data communication and it used visible light spectrum between 400THz to 800THz as optical carrier for the data transmission as well as illumination purpose. The data is embedded in light to create or transfer the large stream of data by changing the rate of flickering, to be clear, by controlling the LED light with data, it illustrate the communication sources. Through LEDs data is transferred from sender to receiver with high speed. Li-Fi provides the speed, usability, flexibility, reliability, security.

Related Work:

In Li-Fi system light (LED) act as main components. For the transmission of data the Light Emitting Diode after emission of light in that data is transfer parallel in form of binary data 0s or 1s format so data transfer at high speed and fast with very small delay. LEDs are turn ON and OFF, Data transmission is done by altering the signalling or blinking light emitting diode i.e. by changing the frequency different data can be generated. The data or information transmitted or modulated any LED light, and the output appears or generated to be constant because of the blinking rate of the light source. Parallel transmission is implemented using many LEDs to increase the amount of data, with LED transmitting a different data stream.



Li-Fi vs Wi-Fi:

Li-Fi is 10,000 times more faster than Wi-Fi

HD

Fig. LI-FI and WI-FI spectrum.

Both system has high speed but Li-Fi gives high speed than Wi-Fi and spectrum of Li-Fi is broader than the Wi-Fi, Li-Fi Data density is high than Wi-Fi. Li-Fi has high security and bandwidth is also high because of high spectrum.

VLC (visible light communication) used to transmit the data wirelessly using light pulses.

The VLC visible light spectrum between 400THz (780 nm) to 800THz (375nm) as the optical carrier for data transmission as well as illumination.

LEDs high speed with enough multiplexing gives data rate is greater than 100 mbps. Parallel data transmission using multiple LEDs is used to increase the VLC rate where each LED transmits a stream of data. If the lights kept on in order transmitting the data, the light can be dimmed to at the certain point and that time the LED light are not able to seen to human eye but still be capable of transmitting data.

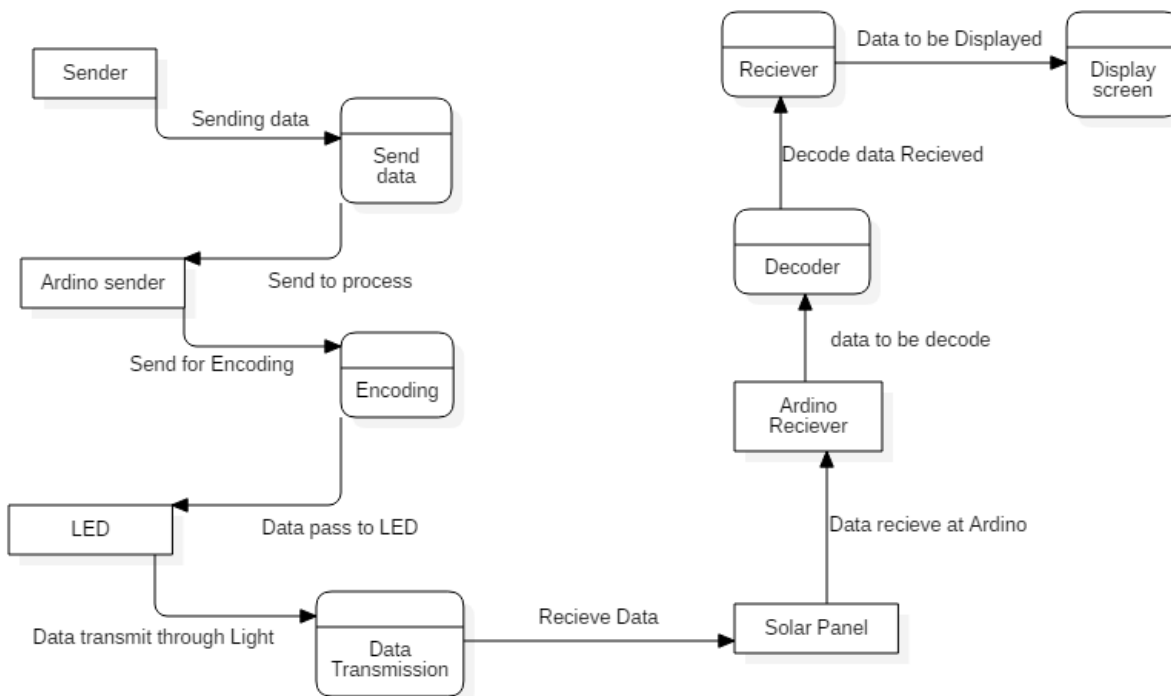


Figure. DFD diagram(Li-Fi Working)

Li-Fi system mainly used to transmit and receive data, when user wants to send data from one end to another it will pass through LEDs driving circuit towards the LED light source panel. When LED driving circuit used to power LED bulb that time LED lights source panel consist of LED bulbs. For the lighting purpose the LED circuit provide the sufficient current at the required brightness, but also prevent the damaging the LEDs by limit the current. Receiver receive the optical signal through solar panel at receiver side. And the transmitted message or data displayed on display screen at receiver side.as like that eventually receiver will receive its data. The speed of LED's is less than 1 μs when Light emitting diodes (LEDs) is switched on and off and it's faster than the human eyes. This invisible of LED's ON and OFF activities are enables to data transmission using binary codes. Switching the ON LEDs is

detects to binary '1' and switching the LED's OFF is detect to binary '0'. it is possible to encode data in the light by varying the rate at which LED flicker ON and OFF to give different string 1 and 0 to pass data. Flickering is very fast that's why human can't notice it a light sensitive device solar panel receive the lights and convert into original message or data.

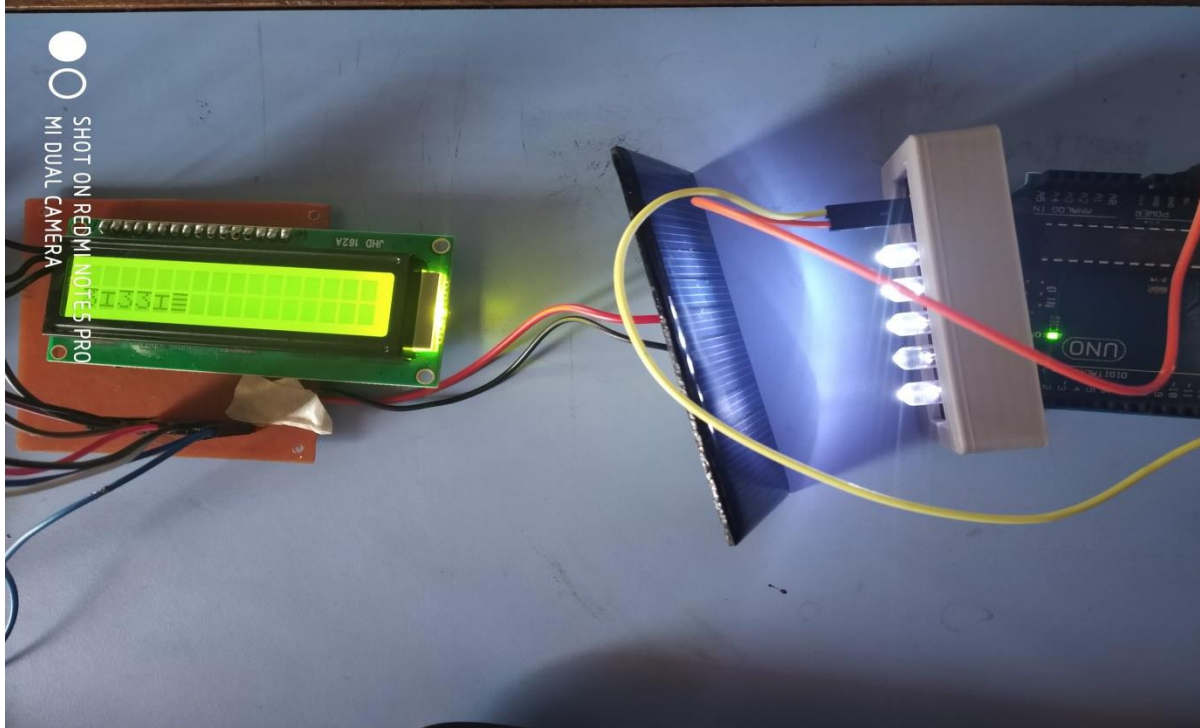


Fig. Receiver

Implementation

The LI-FI components are-

1. High brightness LEDs which act as sources in LI-Fi system.
2. Solar panel which act as receiver or receiving the sender data.

Data send from sender is converted or transferred into an encrypted data format i.e. byte format and then converted into light signal which are produced by the transmitter. The light signal is received by solar panel at receiver side.

Source computer: data reading module-data conversion-transmit

Receiver: Receiver module-interpretation-data display

Different components works as following function:

1. Data conversion working : data convert into bytes so data in digital format. Encrypt before the conversion of data, all data is in encrypted format.
2. Transmission: In that module LED becomes ON and OFF.
3. Receiver : Solar panel is working like receiver and It detect the ON and OFF states of the LEDs. It receives this LED's lights sequence and generates the binary sequence of the received signals.
4. Data interpretation or decryption: In that module convert the data or received data into original format. According to the encryption, it also do the decryption to get original data.

Software implementation:

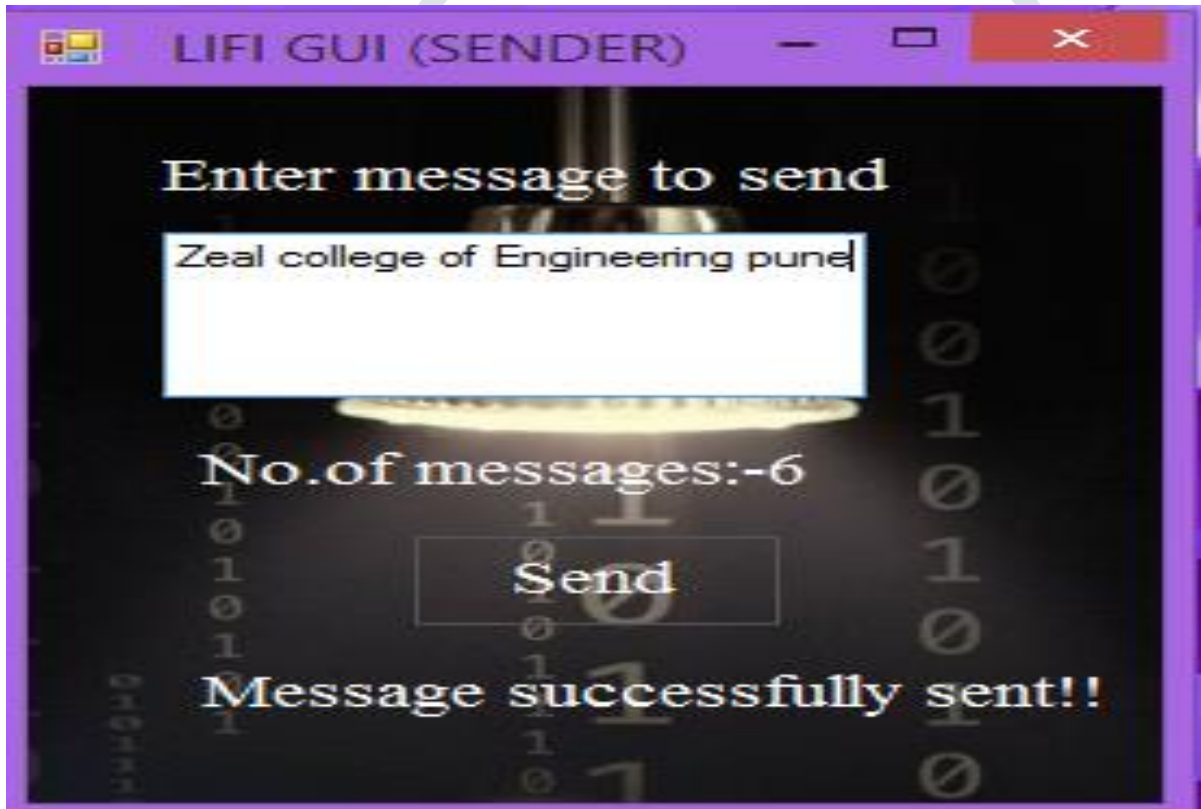
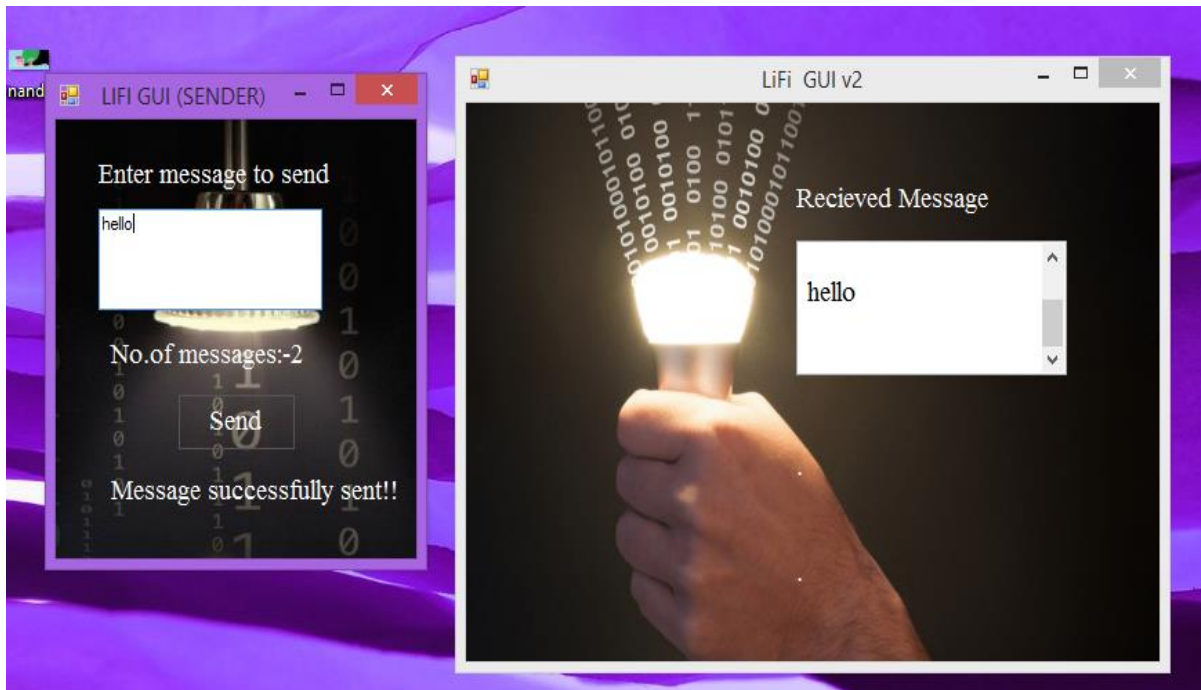


Fig. Sender GUI

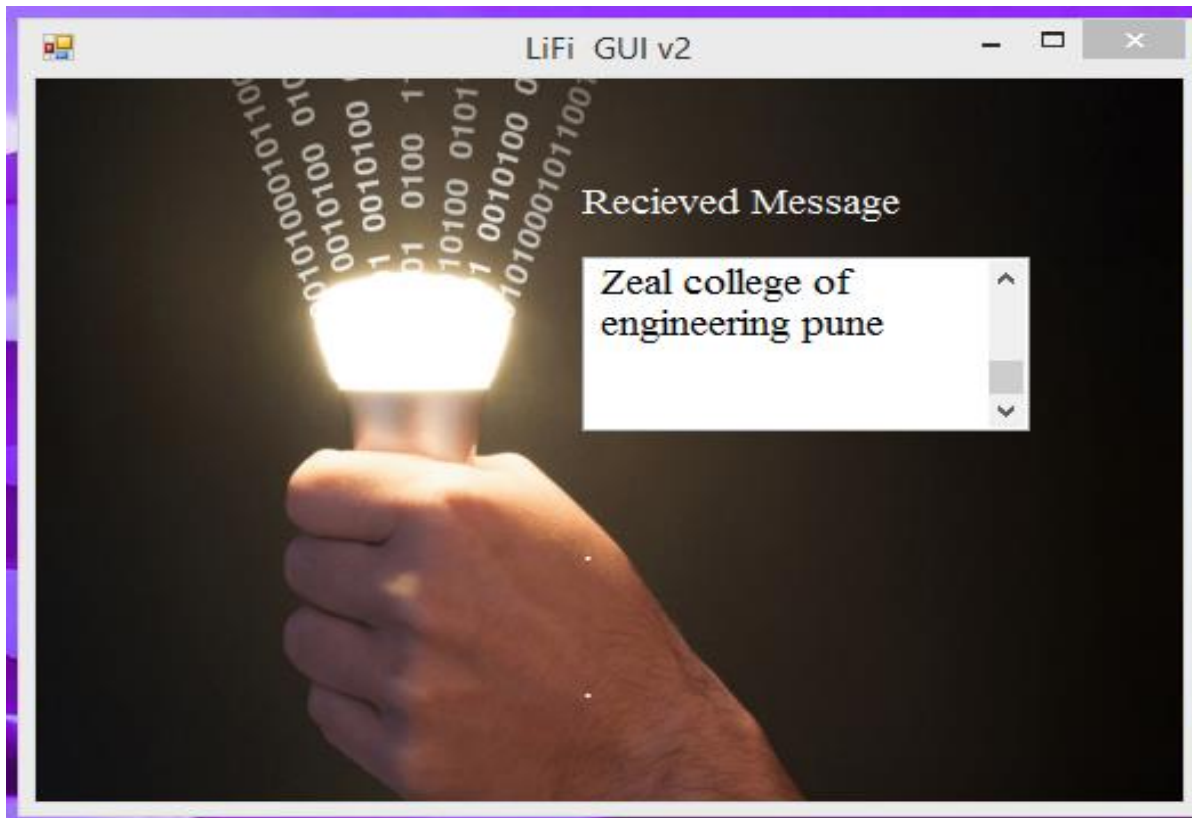


Fig. Receiver GUI

Li-Fi Features:

A: Capacity:

Li-Fi provides the greater bandwidth which is free. Also provide high data density as compared to Wi-Fi . Li-Fi data density is 1000 times better than Wi-Fi, and also less intervention of light than RF waves. Speed is also high than Wi-Fi.

B: Efficiency:

- It requires less number of components so the system has becomes low cost.
- LED illumination is also efficient no more power is required.

c. Safety:

RF waves generate some health hazards .so using Li-Fi system all these hazards or drawback can be overcomes or avoided so LI-FI is safe and non -hazards.

D. Availability:

Light sources are available at anywhere or in any world corner. Hence the availability is not more issue, If the worldwide billions of all the lights are replaced by LEDs then availability is not more issues. Anywhere we can access the data.

Applications:

Li-Fi has many applications which gives benefits than RF.

A. Lightning :

We can use street light as data source means as Li-Fi hotspot.

B. Communication gadget:

Li-Fi gadgets provide the high speed for short range data transfer.

C. Vehicle to Vehicle(v2v) communication:

This is a real Time application of Li-Fi. Vehicle headlights work as source or receiver so data can be transferred Vehicle to Vehicle and communication can be achieved. (It's give instruction to vehicles to keep safe distance between two vehicles.)

1. Medical and health care centre or hospitals:

In the Operating room Wi-Fi are not allowed because of radiations. In several hospitals Wi-Fi is place but the interference from this devices like computers and mobile phones can block the signal from medical components or monitoring equipment's. Sometimes. Li-Fi can solve these problems using lights, lights are important part in hospitals so Li-Fi can be used for many high standard medical equipment or instruments. Li-Fi not emitted any electromagnetic interference so Li-Fi does not interfere with any medical instruments i.e. MRI scanner.

3. Traffic:

To prevent the car accidents LED lights are used in car and it work as Li-Fi system and communication is happen between vehicle LEDs. Vehicles or cars has different head lights or tail lights LED. Street lamps, traffic signals and signs are also transitioning to LED. In Li-Fi the LED's light can be used for effective vehicle to vehicle and vehicle to signals communication. It lead to manage the traffic and accidents.

4. GigaSpeed Technology

Li-Fi system provides fastest data transfer speed. This technology provides effective transmission rates of up to 10 Gbps. In thirty seconds or less than thirty seconds Two hour HDTV film can be transferred using Li-Fi speed. This speed or rate can be increased up to 100 Gbps.

5. Smart class:

Li-Fi Technology is very important and useful Classes, Schools or in Colleges as smart class technology. Teachers can teach 2D 3D animation on large screen using this technology.

Advantages:

Li-Fi can be used electromagnetic sensitive area likes petrol pumps, aircrafts etc. as there wouldn't be interference of any electromagnetic objects. Light passes through any liquid media so it can be used in underwater communication.

Li-Fi technology provides many advantages like safety, fast and efficient as well as security based communication.

Li-Fi provides the Electromagnetic free environment so it can be used for hospital applications.

Conclusion :

So we are can conclude that using the light especially white LED lights data transmission can be achieved. Here we have represented just the data transmission of the text but using same technology we can also transmit any kind of the data no necessarily only text. The speed of the data transmission increases by increasing the intensity of the light or the number of the LED lights. As the data is in the encrypted form it cannot be hacked very easily due to the encryption technique used for the transmission of the data and also the receiving device should be aware of the decryption technique used and we can also conclude that the data cannot be hacked very easily.

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