A Survey on Communication Using LiFi

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ABSTRACT : In the present world, Wireless correspondence has turned into an utility like power, sustenance and water. We utilize it consistently also, all over the place, in our business life, private life, social life. Whether you are using wireless internet in a coffee shop, stealing it from the guy next door, or competing for bandwidth at a conference, you have probably gotten frustrated at the slow speeds you face when more than one device is tapped into the network. As more and more people and their many devices access wireless internet, clogged airwaves are going to make it. One German Phycist, Harald Haas has come up with a solution he calls data through illumination taking the fiber out of fiber optic by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. It's the same idea band behind infrared remote controls but far more powerful. Haas says his invention, which he calls D-LIGHT, can produce data rates faster than 10 megabits per second, which is speedier than your average broadband connection. He envisions a future where data for laptops, smart phones, and tablets is transmitted through the light in a room. And security would be snap if you can't see the light, you can't access the data.

I. INTRODUCTION

Every one of us have progressively gotten to be subject to the web some way or the other. It is difficult to think about a day in our lives, when we are not "associated" to the "net". We are utilizing the web for various purposes, the main among them being sharing of data. In situations where we need to transmit information rapidly and productively, low web rates can be very irritating. Li-Fi is an acronym for light fidelity. Li-Fi is another remote correspondence innovation set forward in 2011 by Harald Haas from the University of Edinburgh. It is a Visible Light Communication (VLC) framework that permits remote exchange of information amongst gadgets and encourages the association of such gadgets to the web. Li-Fi utilizes noticeable light to accomplish this deed and this element makes it to be totally different from Wi-Fi which utilizes radio waves. The Radio waves, infrared and visible light are parts of the electromagnetic range with a slight contrast in frequencies and wavelengths. Previously, infrared-using infrared transmitters (IT) and infrared receivers (IR) - have been utilized for exchange and gathering of information as it can be found in remote control of home apparatuses, for example, TVs, clothes washers, fans, and so on. He utilized fiber optics to send information through LED lights. Light modulation certainly is not another idea, but rather Haas is hoping to take things forward and enable connectivity through simple LED bulbs. .With Li-Fi, we can associate with the web basically by being within range of an LED beam, or we could possibly transmit information utilizing our Vehicle headlights.
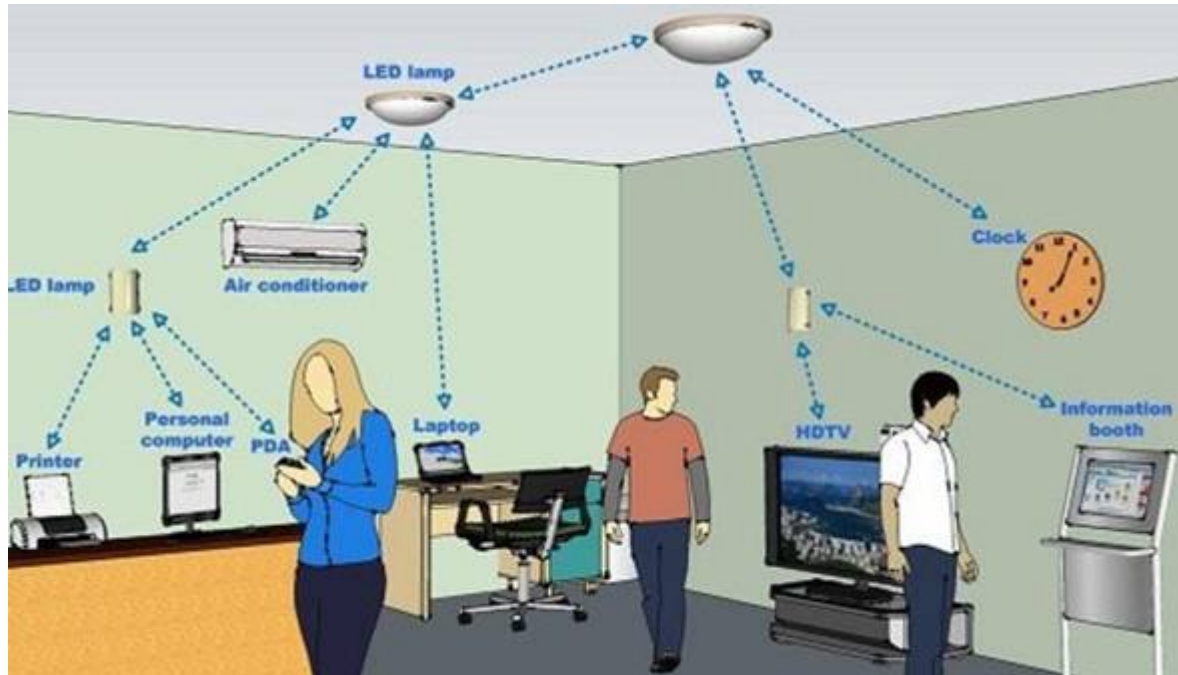
Fig. LiFi Enviroment

II.RELATED WORK

The illumination of the receiving surface for different distances between the LED and photodiode receiver was tested. It was found that with the increase in communication distance, the illumination sharply reduced.

The variation of bit error rate v/s communication distance was also tested and it was found that the system can provide a bit rate of up to 111.607Kbps at distances within 1.5m, and when the distance is high, the BER is very high and limits the bit rate. We can observe that the other wireless technologies such as Bluetooth, Zig-Bee, Wi-Fi, are used for exchanging data, but these technologies does not fulfill all the requirements. Hence Li-fi is the technology which uses LED's for transmitting the data fulfill all the requirements over long range distances.

III.PROPOSED PLAN

The proposed plan of our project is to establish an optical wireless communication model that gives high data rates and transmission distances of up to 1m. By using such technology we can successfully have the capacity to transmit information one device to another using LEDs, in this way setting up a Li-Fi arrange in a confined situation. The block diagram for this project is shown. The Diagram consists of Transmit section and Receive section. The transmit section consists of the data input which is then fed into a switching control system. Based on the data, the switching control generates a stream of 1s and 0s thereby encoding the data in binary. The output of this control is given to the array of LEDs which turn OFF and ON at extremely high speeds. This ON-OFF modulation of the LED light transmits the data. LED is the choice for light source since it consumes very less power when compared to fluorescent lamp or a light bulb. It consumes about one-tenth the power when compared to conventional methods of lighting. Also, the lifetime of a typical LED bulb is several tens of thousands of hours. LEDs are also fast switching with good visibility. Thus, LEDs are ideal for use as the downlink transmitter. For the uplink transmitters, Infrared (IR) can be chosen to be the uplink transmitter for user convenience. This avoids fitting an LED light source on or next to the mobile devices. The receive section consists of a photodiode, e.g. silicon photo detector or an Infrared germanium cylindrical detector. The photo detector demodulates the incoming received signal based on the sequence of1s and 0s. The demodulated signal is then sent to a filter to remove unwanted noise. This filtered signal is then amplified using signal amplification mechanism.

The filtered and amplified signal is then given to an output device such as an LCD display or a speaker. The input signal is thus remotely transmitted and received. In this way, a Li-Fi system is built up.
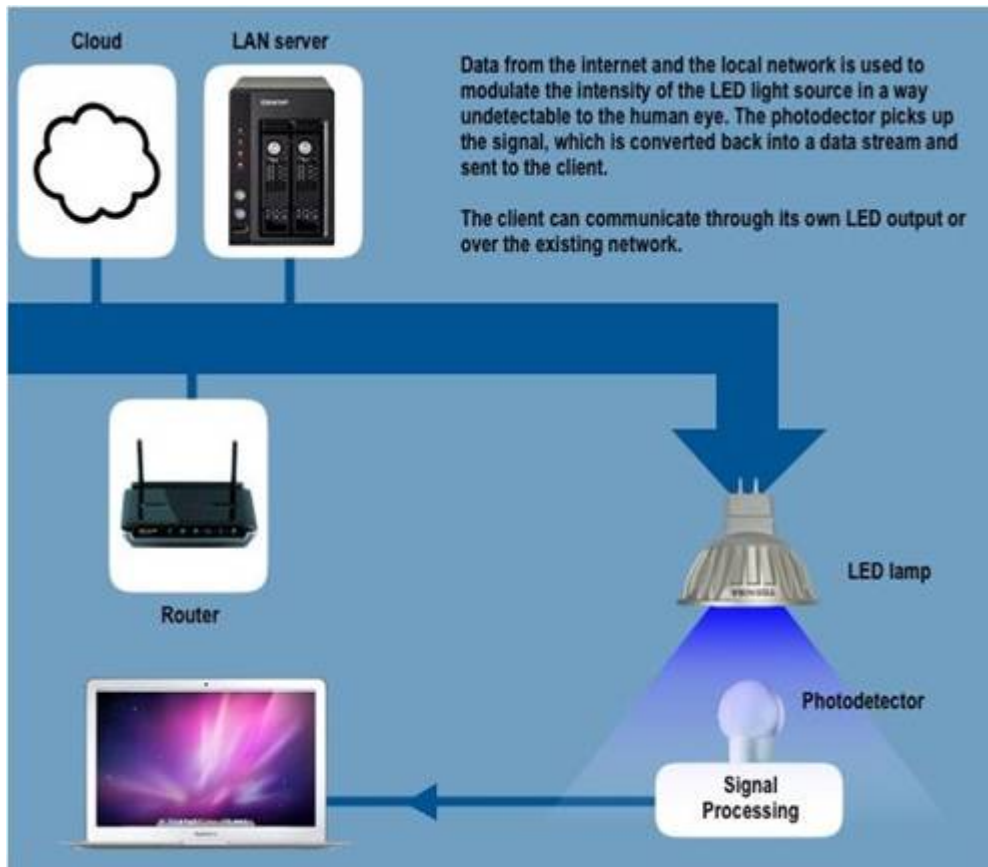

Fig. Data Transmission using LED

IV. PROPOSED ALGORITHM

A. *DESIGN CONSTRAINTS:*

- Availability of hardware: The hardware components of this communication system are numerous i.e. namely bulb, RF amplifier, PCB and silicon photodiode so availability is a major constraint.

- Li-Fi relies heavily on these special LED light bulbs for data transmission.

- The market availability of these Li-Fi compliant LED bulbs is extremely important manufacturing and retail costs of LED are major factor for Internet Service Providers and customers wishing to switch from Wi-Fi to Li-Fi respectively.

B. *METHODOLOGY OF PROBLEM:*

What is a problem. A problem is a situation that presents difficulty or perplexity. Problems come in many shapes and sizes. For example, it can be: Something did not work as it should and you don't know how or why. Something we need is unavailable, and something must be found to take its place. The market is not buying. What do you do to survive?

Customers are complaining. How do you handle their complaints? Once we recognize that a problem exists, your next step is to identify the problem. First, we need to discover how the problem occurred.

1. Did something go wrong?
2. Did something breakdown?
3. Were there unexpected results or outcome?
4. Is something that once worked no longer working?

C. *EFFICIENCY ISSUE*

Problems in Wi-Fi The following are the basic issues with radio waves:

- Capacity: Wireless data is transmitted through radio waves which are limited and expensive. It has a limited bandwidth. With the rapidly growing world and development of technologies like 3G, 4G and so on we are running out of spectrum.

- Efficiency: There are 1.4 million cellular radio base stations that consume massive amount of energy. Most of the energy is used for cooling down the base station instead of transmission. Therefore efficiency of such base stations is only 5.

- Availability: Availability of radio waves is a big concern. It is not advisable to use mobile phones in aero planes and at places like petrochemical plants and petrol pumps.

- Security: Radio waves can penetrate through walls. They can be intercepted. If someone has knowledge and bad intentions, they may misuse it. This causes a major security concern for Wi-Fi.
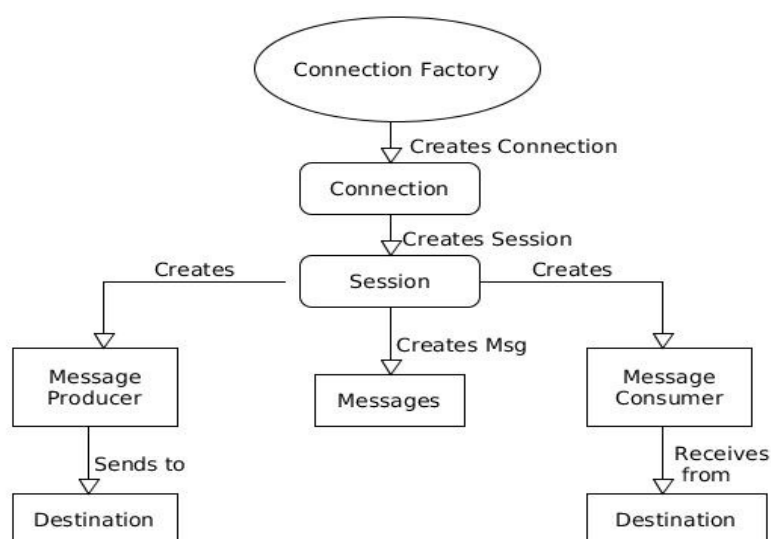
D. *PROPOSED ALGORITHM*

Dig. Li-Fi Communication

Transmitter Algorithm :

Step 1 : Start
Step 2 : Microcontroller Initialization
Step 3 : LCD Initialization
Step 4 : Select com port
Step 5 : Select Band Rate as 9600
Step 6 : Select 8N1 Message Format
Step 7 : Open Edit Box (On PC / Laptop)
Step 8 : Type your Message in Edit Box
Step 9 : Apply AES algorithm for Encryption
Step 10 : Send it to Serial Port
Step 11 : Go to Step 8

Receiver Algorithm :

Step 1 : Start
Step 2 : Microcontroller Initialization
Step 3 : LCD Initialization
Step 4 : Select com port
Step 5 : Select Band Rate as 9600
Step 6 : Select 8N1 Message Format
Step 7 : Open Edit Box (On PC / Laptop)
Step 8 : Receive String from Transmitter
Step 9 : Apply AES algorithm on Receiver Side
Step 10 : Display Message in Edit box
Step 11 : End

V. ADVANTAGES OF LI-FI

1 .Li-Fi can solve problems related to the insufficiency of radio frequency bandwidth because this technology uses Visible light spectrum that has still not been greatly utilized.
2. High data transmission rates of up to 10Gbps can be achieved.
3. Since light cannot penetrate walls, it provides privacy and security that Wi-Fi cannot.
4. Li-Fi has low implementation and maintenance costs.
5. It is safe for humans since light, unlike radio frequencies, cannot penetrate human body. Hence, concerns of cell mutation are mitigated.

VI. APPLICATIONS

Airways:

Whenever we travel through airways we face the problem in communication media, because the whole airways communication are performed on the basis of radio waves. To overcome this drawback on radio ways, li-fi is introduced. The LEDs used in airways is used for transferring the data . This is the main reason which provides communication to the users . The Communication is done in the airways with the help of LED bulbs. It is one of the Important application in LiFi.

Fig. Airway Data Transfer

Underwater communication:

Underwater ROVs, those favourite toys of treasure seekers and James Cameron, operate from large cables that supply their power and allow them to receive signals from their pilots above. ROVs work great, except when the tether isn't long enough to explore an area, or when it gets stuck on something. If their wires were cut and replaced with light — say from a submerged, high-powered lamp — then they would be much freer to explore. They could also use their headlamps to communicate with each other, processing data autonomously and referring findings periodically back to the surface, all the while obtaining their next batch of orders.
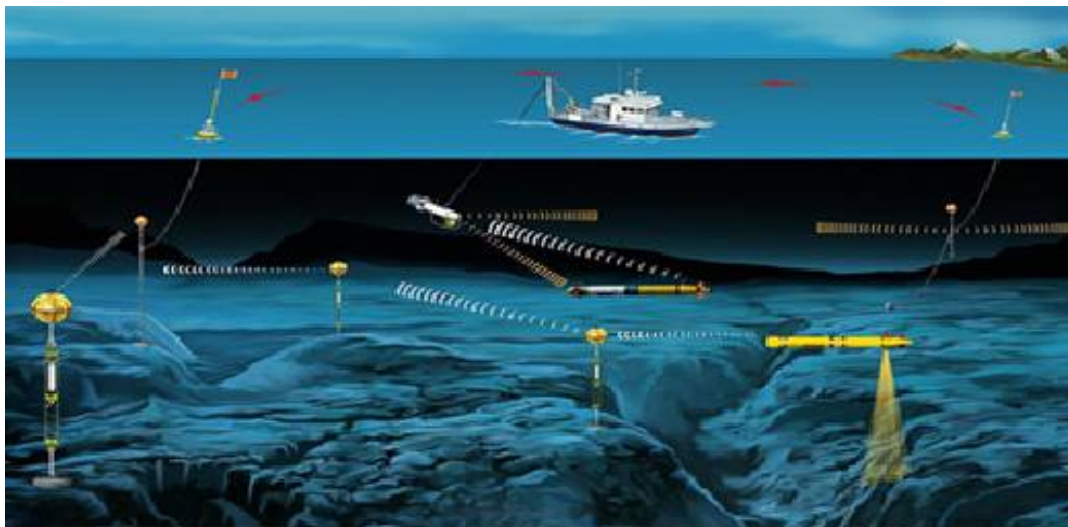

Fig. Underwater Communication

Hospitality:

For a long time, medical technology has lagged behind the rest of the wireless world. Operating rooms do not allow Wi-Fi over radiation concerns, and there is also that whole lack of dedicated spectrum. While Wi-Fi is in place in many hospitals, interference from cell phones and computers can block signals from monitoring equipment. Li-Fi solves both problems: lights are not only allowed in operating rooms, but tend to be the most glaring (pun intended) fixtures in the room. And, as Haas mentions in his TED Talk, Li-Fi has 10,000 times the spectrum of Wi-Fi, so maybe we can, delegate red light to priority medical data. Code Red!

Fig. Lifi Technology used in Hospitals

VII. CONCLUSION

Li-Fi has great potential in the field of wireless data transmission. From this Li-Fi innovation, we can see that the Li-Fi is a propelled approach on configuration, having the best ever outline of web by generally lessening the extent of gadget which exchanges information, execution by method for having more than a large number of lights everywhere throughout the world if supplanted by such LEDS can give doable get to, and last however not the slightest colossal applications contrasted with whatever other systems in different fields which can't be envisioned by on utilize systems. Despite the fact that there are a few hindrances, however can be disposed of via cautious further research. Li-Fi has given a stage forward development in the realm of developing appetite correspondence, this is sheltered to all biodiversity including people and advancing towards a greener, less expensive and brighter fate of advancements.

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