International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 2 Issue: 2 288 – 291

LI_FI Overview and Implementation in Medical Field

PoojashreeN.S[1], P. Haripriya[2] , Muneshwara M.S[3] , Anil G.N[4]

[1,2]V SEM Students, Department of CSE, BMS Institute of Technology, Avalahalli, Yelahanka, Bengaluru-560064,
[3] Assistant Professor, Department of CSE, BMS Institute of Technology, Avalahalli, Yelahanka, Bengaluru-560064,
[4]Associate Professor, Department of CSE, BMS Institute of Technology, Avalahalli, Yelahanka, Bengaluru-560064,
Karnataka, India.
[1]*poojasramaiah@gmail.com*, [2]*priyaharipenugonda@gmail.com*, [3]*muneshwarams@bmsit.in*, [4]*anilgrama@yahoo.co.in*

Abstract- With the wide use of wireless gadgets, the demand of wireless internet is increasing at a very high pace and stealing it from the guy next door, or competing for bandwidth at a conference, the slow speeds you face when more than one device is tapped into the network. When many devices access wireless internet, clogged airwaves are going to make it. To over come this there is a solution known as "Data through illumination". This technology is known as "LI-FI"

Li-Fi is a technology that makes use of LED light which helps in the transmission of data much faster and flexible than data that can be transmitted through Wi-Fi. Light reaches nearly everywhere so communication can also go along with light freely. Light Fidelity is a branch of optical wireless communication which is an emerging technology. By using visible light as transmission medium, Li-Fi provides wireless indoor communication. The bit rate achieved by Li-Fi cannot be achieved by Wi-Fi. Li-Fi is the transfer of data through light by taking fiber out of fiber optics and sending data through LED light.In this paper we are concerned with the use of li-fi in the field of medicine. As the wi-fi cannot be used along with the medical equipments due to the radio waves we implement li-fi in those places.

Keyword: *LI-FI, WI-FI, LED (Light emitting diode).*

*****

1. INTRODUCTION

Li-fi basically known as "light fidelity". The basic ideology behind this technology is that the data can be transmitted through LED light whose intensity varies even faster than the human eye. Now a days wireless technology is popularized as WI-FI which can be further developed as LI-FI. Wireless communication decreases the cost enormously.

Heart of this technology lies in the intensity and the potential of the light emitting diodes. Major reason that leads to the development of the LI-FI is confinement of WI-FI to comparatively small distance. As many devices are coming up in day to day life's the signals are being clogged up due to heavy traffic, so there is a need for error free transmission technology. And the remedy for this problem is li-fi technology. It has been designed in such a way so that it can overcome the disadvantages of WI-FI. Li-fi can work even under water which turns out to a great benefit for the military operations.

They can be switched on and off very quickly, which gives nice opportunities for transmitted data. It is possible to encode data in the light by varying the rate at which the LEDs flicker on and off to give different strings of 1s and 0s.The LED intensity is modulated so rapidly that human eye cannot notice, so the output appears constant. To promote high-speed optical Wireless systems and to overcome the limited amount of radio based wireless spectrum available by exploiting a completely different part of the electromagnetic spectrum. It is made possible to achieve more than 10 Gbps, theoretically allowing a high-definition film to be downloaded in 30 seconds.

In operation theaters or in diagnosing places using machines which work on radio waves and simultaneously using wi-fi to monitor the patients are highly impossible so in order to access net to monitor the patients and also to use radio waves based equipment's we use light fidelity.

2. WORKING OF LI-FI

There are many situations in which people get frustrated with the dull performance signals of Wi-Fi at a place with many network connections in seminars conferences etc… This can be solved using LI-FI.

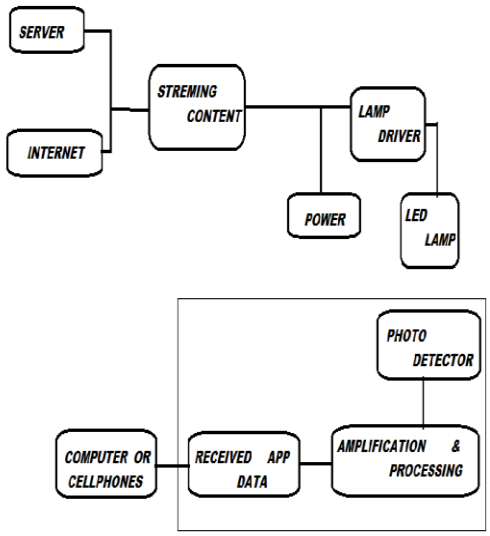

Figure 1: Working of li-fi

When a constant current is applied to an LED light bulb a constant stream of photons are emitted from the bulb which

is observed as visible light. If the current is varied slowly the output intensity of the light dims up and down. Because LED bulbs are semi-conductor devices, the current, and hence the optical output, can be modulated at extremely high speeds which can be detected by a photo-detector device and converted back to electrical current. The intensity modulation is imperceptible to the human eye, and thus communication is just as seamless ad RF. Using this technique, high speed information can be transmitted from an LED light bulb.

Radio frequency communication requires radio circuits, antennas and complex receivers, whereas Li-Fi is much simpler and uses direct modulation methods similar to those used in low-cost infra-red communications devices such as remote control units. Infra-red communication is limited in power due to eye safety requirements, whereas LED light bulbs have high intensities and can achieve very large data rates

3. COMPARISION BETWEEN LI-FI AND WI-FI

Table 1: li-fi versus wi-fi

PARAMETER	*LI-FI*	*WI-FI*
Speed	***	***
Range	*	**
Data density	***	*
Security	***	**
Reliability	**	**
Power available	***	*
Transmit/Receive power	***	**
Ecological impact	*	**
Device to device connectivity	***	***
Obstacle interference	***	*
Bill of materials	***	**
Market maturity	*	***

4. FEATURES

Li-Fi offers a number of key benefits over Wi-Fi but is inherently a complementary technology.

4.1. CAPACITY

Bandwidth: The visible light spectrum is plentiful (10,000 more than RF spectrum), unlicensed and free to use.

Data density:

Li-Fi can achieve about 1000 times the data density of Wi-Fi because visible light can be well contained in a tight illumination area whereas RF tends to spread out and cause interference.

High speed:

Very high data rates can be achieved due to low interference, high device bandwidths and high intensity optical output.

Planning:

Capacity planning is simple since there tends to be illumination infrastructure where people wish to communicate, and good signal strength can literally be seen.

4.2. Efficiency

Low cost:

Requires fewer components than radio technology. **Energy**: LED illumination is already efficient and the data transmission requires negligible additional power. **Environment**:

RF transmission and propagation in water is extremely difficult but Li-Fi works well in this environment.

4.3. Safety

Safe: Life on earth has evolved through exposure to visible light. There are no known safety or health concerns for this technology.
Non-hazardous: The transmission of light avoids the use of radio frequencies which can dangerously interfere with electronic circuitry in certain environments.

4.4. Security

Containment: It is difficult to eavesdrop on Li-Fi signals since the signal is confined to a closely defined illumination area and will not travel through walls. **Control**: Data may be directed from one device to another and the user can see where the data is going; there is no need for additional security such as pairing for RF interconnections such as Bluetooth

5. APPLICATION

The dramatic growth in the use of LEDs (Light Emitting Diodes) for lighting provides the opportunity to incorporate Li-Fi technology into a plethora of LED environments.

Li-Fi is particularly suitable for many popular internet "content consumption" applications such as video and audio downloads, live streaming, etc. These applications place heavy demands on the downlink bandwidth, but require minimal uplink capacity. In this way, the majority of the internet traffic is off-loaded from existing RF channels, thus also extending cellular and Wi-Fi capacities.

There are many applications for Li-Fi. These include:

PARAMETER	*LI-FI*	*WI-FI*
Speed	***	***
Range	*	**
Data density	***	*
Security	***	**
Reliability	**	**
Power available	***	*
Transmit/Receive power	***	**
Ecological impact	*	**
Device to device connectivity	***	***
Obstacle interference	***	*
Bill of materials	***	**
Market maturity	*	***

RF Spectrum Relief:

Excess capacity demands of cellular networks can be off-loaded to Li-Fi networks where available. This is especially effective on the downlink where bottlenecks tend to occur.

Smart Lighting:

Any private or public lighting including street lamps can be used to provide Li-Fi hotspots and the same communications and sensor infrastructure can be used to monitor and control lighting and data.

Mobile Connectivity:

Laptops, smart phones, tablets and other mobile devices can interconnect directly using VLC. Short range links give very high data rates and also provides security.

Hazardous Environments:

VLC provides a safe alternative to electromagnetic interference from radio frequency communications in environments such as mines and petrochemical plants.

Hospital & Healthcare:

VLC emits no electromagnetic interference and so does not interfere with medical instruments, nor is it interfered with by MRI scanners.

Aviation:

Li-Fi can be used to reduce weight and cabling and add flexibility to seating layouts in aircraft passenger cabins where LED lights are already deployed. In-flight entertainment (IFE) systems can also be supported and integrated with passengers' own mobile devices.

Underwater Communications:

Due to strong signal absorption in water, RF use is impractical. Acoustic waves have extremely low bandwidth and disturb marine life. Li-Fi provides a solution for short-range communications.

Vehicles & Transportation:

LED headlights and tail-lights are being introduced. Street lamps, signage and traffic signals are also moving to LED. This can be used for vehicle-to-vehicle and vehicle-to-roadside communications. This can be applied for road safety and traffic management.

RF Avoidance:

Some people claim they are hypersensitive to radio frequencies and are looking for an alternative. Li-Fi is a good solution to this problem.

Location Based Services (LBS):

Highly accurate location-specific information services such as advertising and navigation that enables the recipient to receive appropriate, pertinent information in a timely manner and location.

Toys:

Many toys incorporate LED lights and these can be used to enable extremely low-cost communication between interactive toys.

6. LI-FI IN FIELD OF MEDICINE

There is a very high scope for wireless communication in the medical field. We have many devices that work on wi-fi such as infusion pumps, defibrillators, monitors, lung ventilators and anesthesia machine.

But there are drawbacks in using wi-fi, when we need to access two devices in the same place that Works on wi-fi there results a frequency overlapping problem. For example consider the use of MRI scanners and the patient monitoring devices in the same room, if the doctor has to do MRI scanning of a person and to monitor that person at the same time then there will be a overlapping of radio waves of two different frequencies which leads to the improper diagnosis of patient, in order to overcome this we can implement li-fi in order to monitor the patients i.e., MRI scanners use radio waves for scanning so we can use li-fi to get internet access to monitor patients instead of another radio waves and causing overlapping of signals. There is a probation on the use of mobiles in few areas in the hospitals, this is because of the radio waves overlapping problems to overcome this drawback also we can implement light fidelity in hospitality system. If a doctor has to monitor a patient from his place or to know the information of appointments then they can use this li-fi technology which has a very high data rate.

Where all we to need to access internet along with various EMI we can implement li-fi which provides internet access using visible light.

Further advancements that can be done is replacing the wi-fi based devices using li-fi.

7. CONCLUSION

On implementing this technology its possible to use every bulb as a hotspot, which produces a safer environment.

As radio waves are hazardous to living creatures and leads to endangering of birds we try to reduce this complication using light fidelity which works on visible light frequency and doesn't harm the nature. Another advantage of light fidelity is reduction in the power consumption and transfer of data at higher data rate which wi-fi finds difficult to reach.

Using this technology in medical field makes diagnosis faster and allows to access internet along with the radio waves based devices.

There are disadvantages too in this technology i.e. there should be a particular line of sight and also depending on the bulb used efficiency differs.

So with the implementation of this technology its possible to solve issues such as the shortage of radio-frequency bandwidth and also allow internet where traditional radio based wireless isn't allowed such as aircraft or hospitals.

ACKNOWLEDGMENTS

The authors would like to thank the editor, mysterious reviewers for their valuable suggestions that appreciably improved the quality of this paper, especially to HOD Dept. of CS&E for their constant encouragement and providing us the overwhelming support and guidance to write this paper. Finally also thankful our B M S Educational Trustees, Dear Principal Dr. Ranganath R.V , Teaching Faculties, and Non- Teaching faculties of Department of CSE B M S Institute of Technology, Yelahanka, Bengaluru, Karnataka, India.

REFERENCES

[1] http://en.wikipedia.org/wiki/Li-Fi

[2] International journal of innovative research in computer and communication engineering. Vol.2 April 2013.

[3] IJIEASR, vol.2 September 2013.

[4] www.google.com (Google search engine).

[5] Will Li-Fi be the new Wi-Fi?, New Scientist, by Jamie Condliffe, dated 28 July 2011.

BIOGRAPHIES

Ms. PoojashreeN.S is pursuing her Bachelor of Engineering in Computer Science and Engineering from B M S Institute of Technology,, YELAHANKA, BENGALURU-64, affiliated to Visvesvaraya Technological University, KARNATAKA, INDIA. Ms. PoojashreeN.S may be reached at *poojasramaiah@gmail.com*

Ms. P. Haripriya is pursuing her Bachelor of Engineering in Computer Science and Engineering from B M S Institute of Technology,, YELAHANKA, BENGALURU-64, affiliated to Visvesvaraya Technological University, KARNATAKA, INDIA Ms. P. Haripriya may be reached at *priyaharipenugonda@gmail.com*

Prof. Muneshwara M.S is an Assistant Professor in the Department of Computer Science and Engineering at B M S Institute of Technology, affiliated to Visvesvaraya Technological University, Belgaum, KARNATAKA, INDIA. He has around NINE years of experience in teaching. Prof. Muneshwara M.S may be reached at *muneshwarams@bmsit.in*

Prof. Anil G.N is an Associate professor and HOD in the Department of Computer Science and Engineering at B M S Institute of Technology, affiliated to Visvesvaraya Technological University, Belgaum, KARNATAKA, INDIA. He has around 20 years of experience in teaching. Prof. Anil G.N may be reached at *anilgrama@yahoo.co.in*