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LI-FI in Indian Railways

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Abstract: ***Li-Fi is a wireless communication system in which light is used as a carrier signal instead of traditional radio frequency as in Wi-Fi. Li-Fi is a technology that uses light emitting diodes to transmit data wirelessly. Li-Fi is a form of Visible Light Communication (VLC). VLC uses rapid pulses of light to transmit information wirelessly that cannot be detected by the human eye. This paper demonstrates the working of Li-Fi by simulating a simple circuit which gave us the required output. Li-Fi technology was first demonstrated by Harald Hass, a German Physicist from the University of Edinburgh.***

Keywords: Li-Fi, Wi-Fi, LED (Light Emitting Diode), Optical Communication.

I. INTRODUCTION

Li-Fi stands for 'Light Fidelity'.It is a VLC(Visible Light Communication), technology developed by team of scientists including Dr. Gorden Povey, Prof. Harald Hass and Dr. Mostafa Afgani at University of Edinburgh Li Fi is now part of Visible Light Communication(VLC) PAN IEEE802.15.7 Standard."Li-Fi is typically implemented using white LED light bulbs".These device are normally used for illumination by Appling a constant current through the LEDLi-Fi is the term have been used to label the fast and cheap wireless communication system, which is the optical version of Wi –Fi Li-Fi is light based Wi-Fi that is, it uses light instead of radio waves to transmit information.

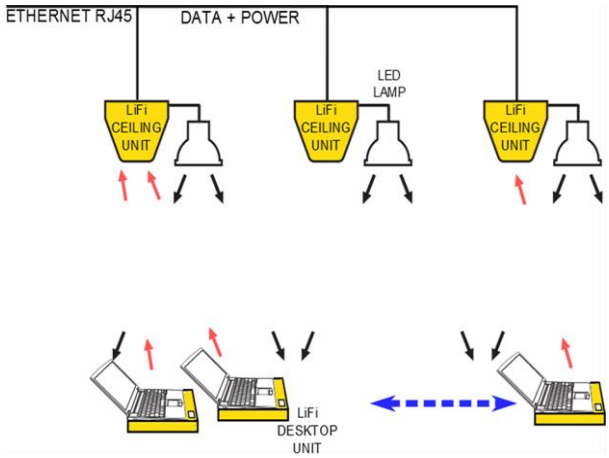
II. WORKING OF LI-FI

Data from the internet and the local network is used to modulate the intensity of LED light source in a way undetectable to the human eye. The photodector picks up the signal, which is converted back into a data stream and sent to the client. The client can communicate through its own LED output or over the existing network.

Operational procedure is very simple, if the LED is on, you transmit a digital 1, if it's off you transmit a 0. The LEDs can be switched on and off very quickly, which gives nice opportunities for transmitting data. Hence all that is required is some

LEDS and a controller that code data into those LEDs. We have to just vary the rate at which the LED's flicker depending upon the data we want to encodeThus every light source will works as a hub for data transmission.

On one end all the data on the internet will be streamed to a lamp driver when the LED is turned on the microchip converts the digital data in form of light sensitive device (photo detector) receives the signal and converts it back into original data. This method of using rapid pulses of light to transmit information wirelessly is technically referred as Visible Light Communication



III. Comparison between LI-FI and 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	***	**

Table 1: Li-Fi versus Wi-Fi

IV. Application of LI-FI in Indian Railway

Railways Minister Suresh Prabhu has announced that Wi-Fi facilities would be provided at over 400 railway stations. Presenting the Railway Budget for fiscal 2015-16 in Parliament, Prabhu said: "This budget is for speedier railway, nine high-speed corridors, high speed trains, and Make in India opportunities. There will be satellite railway terminals in major cities - 10 select stations and Wi-Fi facility will be provided in 400 stations."

According to Indian Railway budget 2015; all station will be having wifi hotspot. So in order to support this budget plan we would like to introduce our concept Li-Fi. All station differ i.e. in length of station, number of platform on a station so their may

be use of many routers or internet access points, but by using Li-Fi concept we can reduce the router quantity and also we can have common access point for each station.

The benefit will be data transmission will be through light, so there can be LED lights on all station

V. LIMITATION

- Light can't pass through objects
- Interferences from external light sources like sun light, normal bulbs, and opaque materials in the path of transmission will cause interruption in the communication.
- High installation cost of the VLC systems
- A major challenge facing Li-Fi is how the receiving device will transmit back to transmitter.

VI. 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:

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.

VII. CONCLUSION

On implementing this technology it's 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.

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