

Li – Fi An Economical and High Speed Wireless Protocol

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Abstract: -- In Information-technology, a protocol is the special Set of rules that end points in a telecommunication connection use when they Communicate. Protocols specify interactions between the communicating entities. Wireless protocol's exchange information through the air waves i.e., without wires. Light Fidelity (Li-Fi) is one of the wireless protocol and it is a visible light communication system running wireless communications travelling at Very high speeds. Li-Fi uses common household Light Emitting Diodes (LED) light bulbs to enable data transfer, boosting speeds of upto 224 gigabits per second. LIFI is similar to that of Wi-Fi. Both transmit data electromagnetically. Wi-Fi uses radio waves where as Li-Fi uses visible light. Li-Fi accommodates a photo detector to receive light signals and a signal processing element to convert the data into 'Stream able content'. Light fidelity (Li-Fi) is a bidirectional, high speed and fully networked wireless communication technology similar to Wi-Fi. The high speeds of Li-Fi could make a huge impact on internet of things also .Li-Fi is more secure than the Wi-Fi. Since homes and offices already have LED bulbs for lighting purposes the same source of light can be used to transmit data. therefore it is very efficient in terms of costs as well as energy. In the present paper, the functions and performances of Li-Fi are discussed.

Keywords: - light fidelity, spectrum, hazardous , micro-controller , user-interface , frequency spectrum , radio frequency , amplification

I. INTRODUCTION

WHAT IS LIFI ?

Lifi is a modern wireless protocol that uses visible light as medium of transmission of data. due to which it is also known as visible light communication. The biggest advantage of this technology is speed - blazing fast data transmission speeds up to 100 times that of Wi-Fi. It has already hit speeds of 224Gbps in the laboratory, while tests under real-life conditions have reached up to 1Gbps, a leap from average Wi-Fi speeds of between 300Mbps and 720Mbps. The concept of Li-Fi was pioneered in Britain in 2011, by University of Edinburgh professor Harald Haas, who is now the chief scientific officer at pureLiFi, a firm which has already released several commercial Li-Fi products. researchers from five UK universities have managed to transmit data at 10Gbps using micro-LEDs with a technique they've coined "LiFi." The team was able to crack the barrier by combining 3.5Gbps streams in each of the red, green and blue frequencies that make up white light. Such a technique could one day work with existing light bulbs, promising higher speeds than current WiFi and increased security. At present WiFi is dominating wireless internet protocol that uses radio waves for the transmission of

data. It consumes more power compared to that of the wired data transmission

II. FEATURES OF LIFI

Li-Fi features include benefits to the capacity, energy efficiency, safety and security of a wireless system with a number of key benefits over Wi-Fi but is inherently a complementary technology.

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.

Low cost: Requires fewer components than radio technology.

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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.

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.

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.

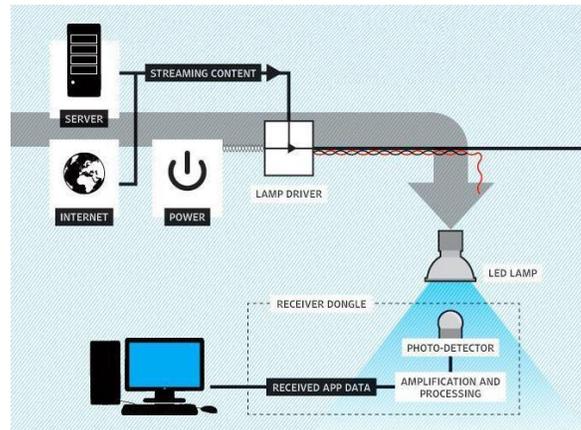
Control: Data may be directed from one device to another and the user can see where the data is going; there is no need for additional security such as pairing for RF interconnections such as Bluetooth.

III. CONSTRUCTION AND WORKING

the construction of LIFI includes

1. Data source
2. Micro controller or lamp driver
3. LED lamp
4. Photo detector
5. Amplification and processing unit
6. User interface

the pictorial representation of the above units is as shown



data source :- data source is the starting unit in the modular construction of the LIFI mechanism and it is where the data to be transmitted is stored

Microcontroller or lamp driver :- Microcontroller is the device which governs the flow of streamable data content into light of particular intensity in the LED lamp

LED lamp :- LED lamp is the device which illuminates the streamable data content in the form of light

Photo detector :- Photo detector is the device which converts the illuminated light into streamable data content.

Amplification and processing unit :-

amplification and processing unit amplifies the decoded content and process it for displaying it in the user interface

User interface :- user interface is maybe considered devices through which the user is able to view the streamable content.

functioning of lifi:-

as we know lifi is a visible light communication system. this means that it accommodates a photo detector to receive light signals and a signal processing element to convert the data into streamable content. Data is fed into

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an LED light bulb (with signal processing technology) , it then sends data (embedded in its beam) , at rapid speeds to the photo detector (photo diode), the tiny changes in the rapid dimming of the LED bulbs is then converted by the receiver into electrical signal. The signal is then converted back into a binary data stream that we would recognize as web , video and audio applications that run on internet enabled devices.

PERFORMANCES OF LIFI

- lifi system does not have any interferences issues similar to that of radio frequency waves which is used in wifi
- light is blocked by the walls and hence provide more secured data transfer
- lifi uses 10,000 times frequency spectrum of the radio
- lifi can work in high dense environment

APPLICATIONS OF LIFI

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.

Hazardous Environments: Li-Fi provides a safe alternative to electromagnetic interference from radio frequency communications in environments such as mines and petrochemical plants.

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.

CONCLUSION

LIFI is a bidirectional , high speed and fully networked wireless communication technology similar to that of wifi. But unlike wifi , li-fi uses the existing LED bulbs to

transmit data when coupled with a lamp driver. This makes it more economical. When tested under real life conditions the achieved speeds were upto 1GBPS. Still this was an amazing speed to get via wireless. Therefore lifi is high speed, economic, more secured wireless protocol having huge applications in future.

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