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Research Paper

Li-Fi – the future of wireless technology

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Abstract

In this era of technology the number of gadgets such as mobilephones, smartwatches, digital glasses and health trackers are used extensively by people in a large scale. The data traffic is abundant as the available radio frequency is limited, so the demand for the wireless network is keep on increasing. In order to meet the future demands there was a development in the optical communication method known as Li-Fi (Light-Fidelity).This will offer more bandwidth than the RF spectrum. They make use of LEDs to transmit the data. The main advantages of the Li-Fi is that there is no need of licensing and has a huge amount of unregulated bandwidth and there is zero electromagnetic interference so that the health hazards are nullified.

Keywords: *Li-Fi (Light Fidelity); RF (Radio Frequency) LED (Light Emitting Diode); Optical Communication.*

1. Introduction

It is the recent trend in the communication system which uses LEDs, Light Emitting Diodes to transmit the data. It transmits them much more faster Wi-Fi. It is basically a 5G technology which utilizes light waves as a medium of communication .In recent years there has been a sudden increase in the usage of visible light for the communication purpose.It is one of the category of wireless communication technologies which uses optical light as a medium to transfer and receive data. Unlike the IR and UV communication ,it uses the same light for illumination and communication. When considering the bandwidth of light free space communication networks which uses LED technology, is comparatively high when compared to RF based transmissions. They can render high speed transmissions .The energy consumption is much lower .They have the potential to deliver data at much higher speed for a medium range communication than all the existing wireless technologies. As this spectrum is uncensored and offers huge bandwidth they can be used for many internet of things.

1.1. Working of Li-Fi technology

The basic functioning of Li-Fi is pretty easy one. The calibre have a luminous origin from LED light heads at pathway supplier, at an edge and a luminous sensor at other edge . When the LED light outset to bloom, the locator or sensor will recognize light. The plank gorges into the locator at a maximum speed. A receiver then proselyte the meagre variation in the volume into an electrifying signal, which gets proselyted back into a data source and passed to the consignee. If the light emitting diode is ON, one is connected to the network which means we send a digital 1 and if it is OFF we transmit a digital 0 or we are not connected to the network. As one can turn them on and off whenever one can transmit data so hasty that human eye. cannot notice, so the output in form of light emerges perpetual and therefore rendering durable access.

Fig. 1: Working of Li-Fi.

1.2. Applications of Li-Fi

It has its applications in many technologies, In educational systems, and in some location based services and acts as a defence mechanism in military as the data's can't be decoded if they use light waves for transmission as they cannot penetrate through walls. They find places in augmented reality and toys which has LEDs to communicate among themselves. They are used in indoor communication and in dense environments. They find their application in the smart homes for switching on and off the equipments connected with light waves for their working. The other applications are listed below

a) Medical Applications

Numerous devices used inside the operation theatre of hospitals make use of light waves as Wi-Fi has the drawback of generating radio waves which causes the monitoring devices of the patients to malfunction which causes to harm .In many places fibre optics are used and it is much costlier .As Li-Fi is economical many robotic surgeries are done making use of this technology as it is free from electromagnetic radiations.

Fig. 2: Led Lamps Used Inside Operation Theatres.

b) Internet communication in Aviation industry

The passengers inside the carrier are charged surplus amount as charges for internet usage. They would provide data with a less speed. That makes a huge loss to the onboard passengers. As Wi-Fi cannot be used in the space, as it may interfere with the aircraft system by generating radio waves.Li-Fi finds a place for this type of communication. And the LED bulbs which are used for lighting helps in the data transmission at less cost and much more speed.

Fig. 3: Leds Used Above the Passenger Seat.

c) Underwater research

The RF waves cannot penetrate deep into the water. They gets absorbed. They can travel only to a certain distance. but light waves can penetrate much deeper, so researchers make use of this technology for communications under water. They make use of the LED headlamps for sending signals .The remote operated vehicles uses this technology for communicating. The marine life is not disturbed by this kind of waves.

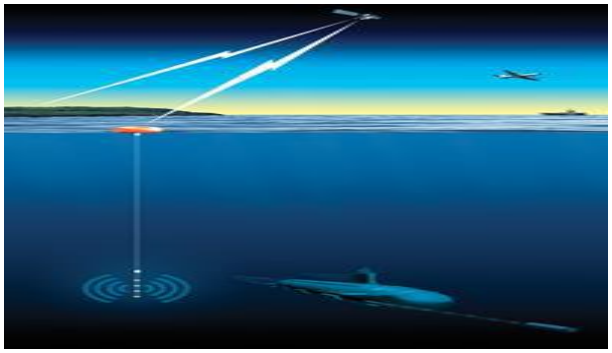

Fig. 4: Underwater Communication.

d) Managing Natural calamities

During natural calamities such as storm ,earthquakes and hurricanes the communation channels which makes use of radio waves are cut off .So that the people are unaware of what's happening around and can't predict what's going to happen. So they make use of the LED lights in streetlamps for communicating purpose, whenever a person comes under the light he gets the needed information. They are much useful in emergency communication

e) Power plants

The power plant has many interconnected systems to monitor grid integrity, and to measure the temperature of the core and the demands. As they are much sensitive to radiations RF waves are not used. So in this case Li-Fi plays an important role in monitoring them for the safety purpose of the plant to reduce the cost of transmission. Owing to this safety they find usage in other petroleum and chemical plants too.

Fig. 5: LED Lit Power Plant.

f) Traffic signals

The traffic signals make use of the LED of the cars headlight to transmit the signals. This would render the free flow of vehicles and reduces the waiting time. It can communicate with the vehicle moving front and back and alerts the driver if they comes much close so that the number of accidents can be reduced effectively.

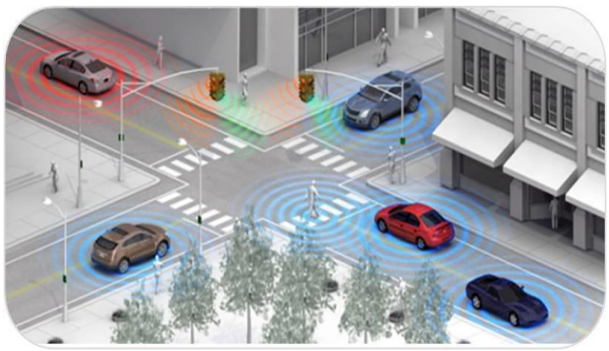

Fig. 6: Lifi-Environment in Traffic Management.

2. Conclusion

The Applications for this technology are plentiful and can be further tested. This technology gets used in the places where there is a deficit in the frequency bandwidth and places where RF spectrum cannot be used such as health centres, airlines, sub aquatic and power generating plants. Off course we can use our normal bulbs in future for transmission which leads to eco-friendly environment. This technology is not only free but also safe and secure.

Future enhancements

As light is universal and free of cost, there is a great purview for the progression of this technology. In future enhancement all the street lights, even car headlights can be used as a source for Li-Fi connecting points to transfer data so that internet can be accessed anywhere. The advancement in this technology renders a speed of more than 12GBps and can download an HD movie in seconds.

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