Chapter 13

Light Fidelity:
Data Through Illumination

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ABSTRACT

This chapter discusses the relevant effects of li-fi technology in data transfer. The chapter should enable the reader to identify and relate to evolving data transmission technology. The chapter gives details of the basic components of li-fi. This chapter also discusses data transmission through light. The chapter should enable the reader to identify the difference between VLC and li-fi communication. The chapter also discusses the important properties, misconceptions, and limitations of this emerging technique. Furthermore, how various modulation techniques used in li-fi and its advantages over wi-fi technology has been mentioned in this chapter. The authors elucidate the major challenges and application areas of li-fi.

INTRODUCTION

Wireless technology has developed strikingly which make progressing communication. Today, encouraged by Radio Frequency circuit fabrication and numerous switching techniques, moderate rapid media transmission has been to a great extent conveyed over the world. Wireless communication faces speed problem when associated with various devices. Fixed transmission capacity limits high data transfer rates and interfaces with a secured system. Presently, the increasing enthusiasm for Wireless communication, the existing radio range beneath 10 GHz has turned out to be insufficient. Expected to relentlessly growing stipulation for wireless communication, Wi-Fi is going up against numerous troubles clog, density, safety, cost sufficiency, accessibility, effectiveness, and security.

Li-Fi is developed to transmit information at high rate up to 14 Gbps. To overcome the looming spectrum crunch frequency reuse concept may be adopted. This methodology has been utilized effec-
Light Fidelity

tively and introduces the concept of small cell. Be that as it may, decreases in cell sizes are progressively hard to accomplish because of the high infrastructure cost for data link. For these reasons, the optical resources are copious as appeared in Figure 1. Also, it is license-free. As of now, no regulation exists for the spectrum of infrared as well as visible light. It can offer bandwidth up to 780THz (Kuppusamy, P., Muthuraj, S., & Gopinath, S. 2016; Ramadhani, E., & Mahardika, G. P. 2018). The advancement of Li-Fi is to overcome the lack of existing technology.

Li-Fi is the condensing of light fidelity and was communicated by Harald Hass, a German physicist in his concept of “wireless data from every light”. In Li-Fi, data is transferred using light signals instead of radio waves. It outfits well data transmission. In the coming age, this innovation will be utilized for transmitting information through the light in a closed territory. It is an innovation that uses a light emitting diode (LEDs) to transmit information remotely.

It uses a bidirectional light and wireless method of communication. The transceiver will play an important role to establish a proper communication link between points/nodes. The function of Transceiver is to relay and receive data in the Li-Fi system. The modulation technique used in transceiver allows the LED used in the system to know how to use the light. This technology is appropriate for highly dense information area. It is also suitable for minimizing radio interference problem in a constrained region.

Figure 1. The Electromagnetic spectrum

The electromagnetic spectrum can be classified from radio waves to gamma rays shown in Figure 1. The authors of Sharma, R. R., & Sanganal, A. (2014) and Kavehrad, M. (2010). have discussed in their research some spectrums which are mentioned below:

1. Radio waves (30 Hz-300GHz): This becomes insufficient for increasing data. Also, due to spectrum cost Radio waves are expensive. It is less safe due to interference.
2. Infra-red (300GHz-400THz): Generally, it is useful for Low power application and analysis of organic compounds. Safety is the major concern while using Infrared at high power. So it is advised to use Infrared with less power.
3. Visible light (400THz–790THz): This spectrum range is detected by the human eye. It is that part of the electromagnetic spectrum that has not been used until now.
4. Ultra Violet (800THz-30PHz): It causes chemical reaction and also adversely affects the human body. It has a tendency to penetrate the skin. However, this may be considered for the purposes of on-the-spot communication without individuals.
5. X-rays (30PHz-30EHZ): Generally, used in medical and security purpose.