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Li-fi, Wi-fi, Mobile Communications and their Applications During COVID-19

P. Hepsibah Kenneth[1], E. Mahima Jane[2]

[1]Temporary Assistant Professor, Madras Christian College, Chennai
[2]Assistant Professor, Madras Christian College, Chennai.

Abstract:

In the era of digitization, world is battling against a rare type of disease COVID-19. This in turn led to the closure of all academic institutions, offices around the Universe. Hence all the offices and educational institutions started online to carry out their task by working from home. Even medical professionals used online methods for treatment. There is a surge in the internet traffic. Personal devices use some communication method to connect to internet. Wireless technology based on radio waves is the most frequently used. Economy also slightly improved because of all these methods. Cost, health hazards, feasibility are considered while using these technologies. This paper focuses on the need of wireless technologies, outline of the principle of Li-Fi, Wi-Fi networks, the applications of these technologies during COVID -19 and the challenges faced by them.

Keywords: Li-Fi, Wi-Fi, Mobile, Radio Transmission, COVID-19

1. Introduction

In the situation like COVID-19 to maintain social distancing and to reduce the spread of the virus lockdown is implemented in many countries. This in turn allows the people to perform their activity from home. Telecommunication is a field where there is an increase in the clients during Pandemic. Wireless communications facilitated many to work from home and kept individuals to get information about the society, related to health, banking and other essential services. Wireless communication normally uses radio waves for transmission [1]. This technology is used to communicate via routers to the various devices such as mobile, desktop, laptops, tablet etc. Mobiles use satellites to enable internet. This method is called as Wi-Fi.

Recently a new technology called light fidelity is proposed by Harald Haas, German Scientist [1], [2]. The focus of this technology is to transmit the data using visible light transmission. Li-Fi technology is a communication which is effective in limited geographical location. It provides better bandwidth [5], efficiency, and safety when compared to Wi-Fi. Remote villages can also be benefited using Li- Fi technology. Previously cable and dial-up connections was used for transmitting information. This was slow and costly to install.

1. Principle of Li-Fi, Wi-Fi and Mobile technologies

In Wi-Fi the radio signals are received from antennas and routers which in turn received by the laptops, cell phones. When the range of Wi-Fi is nearer to the receiving device then the communication will be faster. The device speed is based on the main source. The term wireless instead of cables it is through air [4]. The below figures show the range of different types of radiation.

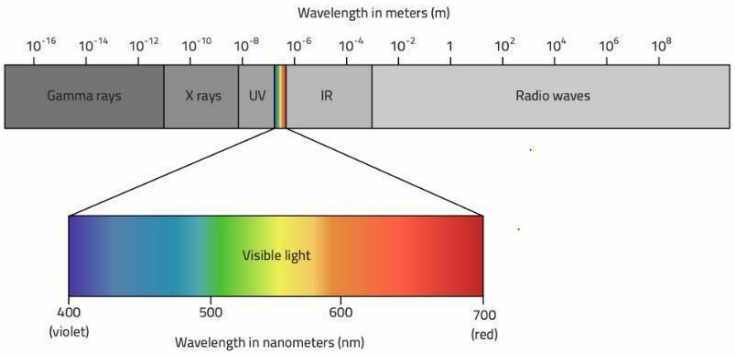
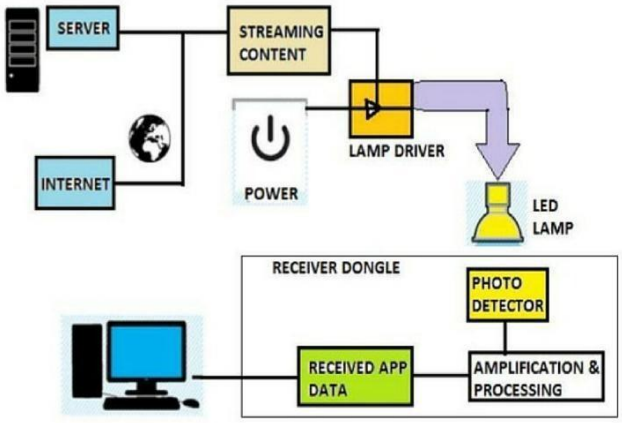


Fig. 1 Electromagnetic Spectrum

Mobile communication transmits information via satellites and hence it is used while travelling. Wi-Fi is commonly used in Public transport, homes, academic institutions which is used by everyone who are in the range. In the above figure, the range of radio waves can be seen.

Li-Fi technology [6] involves the transmission of information by sending them through the LED [Light Emitting Diodes]. Figure 1 shows the bandwidth between radio waves and visible light. The data are directly given through the computer, which are



converted into electrical signals by the controller through the interface circuit. Then the signals drive the LED bulbs. Thus, electric signals are converted to optical signals. The optical signals are delivered to the receiver through the wireless channel [8].

Fig 2. Working of LiFi

The working of Li-Fi is shown in the above figure. LED is used as a light emitter which can take 0 for off or 1 for on. This is received by a photo detector which is a single bit data transmission. Such a way many LED's can be used for large data transmission [10].

2. Applications and advantages of Li-Fi, Wi-Fi and Mobile communication during COVID - 19

The following are some of the applications where Li-Fi and Wi-Fi technologies used during Pandemic

Academics: In the current scenario online teaching is used in academic institutions. Li-Fi provides faster speed for accessing information. During online teaching the speed and the efficiency is very much needed. Mobile data allows listening live videos even during travelling. Research meetings and Viva is done through video conferencing. Faculty Development programs are organized through online. Many top universities around the world started online short-term courses during pandemic which led students and academicians to boost their knowledge.

Hospitals: Operation theatres avoid Wi-Fi because of the radio waves. Hence, Li-Fi technology [9] which uses light is used to make advance methodologies through the internet. Doctors use video conferencing for consultation. In India, wards at Surat Municipal Institute of Medical Education & Research (SMIMER), Gujarat is using Li-Fi technology for monitoring COVID-19 patients which help them to avoid radiation. Critical patients are monitored from their homes to avoid congestion and transmission in hospitals [11], [12]. Even Covid-19 patients are monitored from home which reduces the risk of health workers. The number of beds available in the hospitals are listed in the government sites which enables people to choose hospitals for treatment. Blind people are given warning when barriers are nearer to them through Li-Fi technology [3].

Airlines: Passengers travelling in aircraft can avail the access of the internet without any disturbance using LED [1] when compared to radio frequency. Passengers boarding flight are checked by Aarogya Setu App in India, for contact tracing and mapping the geographical locations they travelled. Many countries all over the world monitored the passengers who travelled from other countries through the mobile communication.

Submarine: Li-Fi [6] even work underwater which helps them to be connected via devices.

Electronic devices: Televisions, Mobiles, laptops, tablets, and other smart devices can easily connect with each other though wireless communication. The short- range network of Li-Fi yields exceptionally higher data rates and higher security. These devices help people to communicate near and far and get rid of loneliness.

Information Technology: IT companies enabled all the users to work from home. Using higher bandwidths, they can perform their regular routine. Hence, companies are able to pay salaries for the employees. Post Pandemic also some companies are creating hybrid methods so that they can reduce the cost of infrastructure by allowing employees to work from home.

Restaurants: During the lockdown hotels are able to send food parcels. This enabled senior citizen, sick people to receive food through various food delivering apps.

E-Commerce: Online shopping enabled users to buy things without venturing out during this pandemic. Textiles create a virtual video of their product to the customers.

Provisions, medicines, food delivery are delivered online through various applications. Amazon employed more employees during pandemic to facilitate the needs of the customers. There is a surge in the online grocery shopping because of the fear of not maintaining social distancing in shops.

Banks: There was a surge in the number of people using electronic transfer which led to paperless transactions. Banks provided loans to customers through online by verifying the scanned documents through a registered email id and mobile number.

Entertainment: Zoological and botanical parks, live telecasts events. This allowed the audience to have a real- life experience. There is an increase in the Netflix, YouTube and Amazon Prime subscribers during the lockdown. Many started creating YouTube channels for fun, education, songs and started to earn based on the number of subscribers.

Religion: During pandemic religious places started live telecast which allowed people to attend the service. Zoom, Google meet are some of the applications used for the live telecast. YouTube enabled us to watch at any convenient time.

Government: Drones are installed to monitor people and identify social distancing norms [14]. Parliamentary members use video conferencing mode for meetings and discussions. In China [13] drones are installed to deliver medicines. In India travels between districts and states for emergency needs such as death, marriage is done by applying e-pass through online. Surveys are conducted online to get the feedback on pandemic from people in different geographical locations.

Recruitment: Interviews are held through video conferencing due to the epidemic. Recruited employees can take up training online and enroll them in the company.

3. Challenges of Wireless Technology during COVID-19

Network traffic: The overall usage of people accessing internet increased which lead to network congestion. Rural area people are unable to get effective network coverage.

Health Hazard: Extensive use of electronic gadgets leads to eye problem. Radio waves also affect human health [7], [15]. The sudden change from offline to online teaching has increased the stress on academicians.

Cybercrime is increased during this time of the outbreak and even multinational companies' data are facing cyber- attack. Through social media fake news are spread quickly using these technologies. Scams have become common in online like telemedicine etc.

4. Conclusion

In the current scenario of Covid-19 communication has enabled us to perform our work without many hurdles using wireless technologies. Banking, HealthCare, Academics, Entertainment are all done from home. Wireless technologies such as Li-Fi or Wi-Fi or mobile enabled to do activities by saving time and economy. Citizens were able to get essential items even during the lockdown with these technologies. In Post Pandemic, many companies are enabling work from home model and reduce infrastructure. This may reduce the population in urban areas. Smart cities can be developed using wireless communications which can improve safety, natural calamities can be alerted quickly. Digital platforms should be created in such a way even the uneducated can easily manipulate.

References

[1]. Imran Siddique, Muhammad Zubair Awan, Muhammad Yousaf Khan, Azhar Mazhar, "Li-Fi the Next Generation of Wireless Communication through Visible Light Communication (VLC) Technology", volume 5, Issue 1January-February-2019.

[2]. Zahraa Tareq Aldarkazaly1, Manal Fadhil Younus2*, Zainab Salim Alwan Data Transmission Using Li-Fi Technique , International Journal of Advanced Science and Technology Vol. 29, No. 03, (2020), pp. 7367–7382.

[3]. Nagumotu Sree Jyothi , Venkatesh Narapusetty, Neha Deka, Padmaja.S, Prof. Sugandha Saxena, Indoor Navigation System for Visually Impaired Using LIFI Technology International Journal of Scientific Research and Review ISSN No.: 2279-, Volume 07, Issue 03, March 2019.

[4]. Mohaiminul Islam, Shangzhu Jin. An Overview Research on Wireless Communication Network. Advances in Wireless communications and Networks. Vol. 5, No. 1, 2019, pp. 19-28. doi: 10.11648/j.awcn.20190501.13.

[5]. E Ramadhani, G P Mahardika; " The Technology of LiFi: A Brief Introduction" Department of Informatics, Universities Islam Indonesia, Yogyakarta, Indonesia [IOP Conference Series: Materials Science and Engineering]

[6]. A. Shetty, "A Comparative Study and Analysis on Li-Fi and Wi-Fi," International Journal of Computer Applications, vol. 150, no. 6, pp. 43- 48,2016.

[7]. C. W. D. Lumoindong1, A. Muslim, B. M. Nasreddin,M. Galina, "Performance and Environmental Impacts Review of Li-

Fi and Wi-Fi Technologies", Journal of Env. Engineering & Waste Management, Vol. 3,No. 2, October 2018: 68-75

[8]. Pavas Goswami, Manoj Kumar Shukla, Design of a Li-Fi Transceiver # Wireless Engineering and Technology, 2017, 8, 71-86.

[9]. Safwan Alfattani, "Review of LiFi Technology and Its Future Applications", Journal of Optical Communications · June 2018.

[10] Sapna Mamidkar, Rasmiranjan " A survey of Li-Fi Technology and its Applications", International Journal of Science and Research 2016.

[11]. Thomas Schulz, Karrie Long, Kudzai Kanhutu, Ilana Bayrak, Douglas Johnson, Timothy Fazio, Telehealth during the coronavirus disease 2019 pandemic: Rapid expansion of telehealth outpatient use during a pandemic is possible if the programme is previously established Journal of Telemedicine and Telecare, First Published 19Jul 2020.

[12]. Smith, AC, Thomas, E, Snoswell, CL, et al. Telehealth for global emergencies: implications for coronavirus disease 2019 (COVID-19). J Telemed,Telecare 2020;26: 309–313.

[13]. S.Q. Zheng, L. Yang, P.X. Zhou, H.B. Li, F. Liu, R.S. Zhao Recommendations and guidance for providing pharmaceutical care services during COVID-19 pandemic: a China perspective Research in social and administrative pharmacy (2020 Mar 26).

[14]. M. Richardson, "Pandemic drones: Useful for enforcing social distancing or for creating a police state?" https://gcn.com/articles/2020/03/31/.

[15]. M. L. Pall, "Wi-Fi is an important threat to human health," Environmental Research, vol. 164, pp. 405-416, 2018.