International Journal of Advance Research and Innovation
Vol. 7(3), Jul-Sept 2019, pp. 72-76
Doi: 10.51976/iiari.731910

Article Info
Received: 04 Aug 2019 | Revised Submission: 29 Aug 2019 | Accepted: 31 Aug 2019 | Available Online: 15 Sept 2019

Wired and Wireless Modes of Communication and Their Comparison

Uttpal Raj and Naresh Kumari***

ABSTRACT

Communication is basically the method used for transferring the message/information from one place to another. There are various elements used in this process. All the elements have their own specific roles. Transducer helps in conversion of one energy form to another, it converts message signal to electrical signal. Transmitter transmits the signal from transducer to channel. Transmitter basically encodes the data after amplifying it and decodes the same data. Channel carry the information from source to destination. Channel also carry noise including the output as an error. This is the basic process of communication. This process works the same for wired communication and wireless communication. These two type of communication methods have different advantages as well as disadvantages but still the process is same. The research aspects in communication technology have vast future.

Keywords: *Semiotics; Laser; Insulation; Wired; Lithotripsy; Wireless; Blue-Green.*

1.0 Introduction

In 21st century where technologies are developing day by day different modes of communication is also enhancing. Improving technologies reduces errors and efforts. Communication is an act of imparting or exchanging data (information) by speaking writing, or using some other semiotics ways. The main steps inherent to all communications starts from source then encoding after that transmission/reception and finally decoding as shown in Figure 1. Communication is of two types: (i) Wired and (ii)Wireless type of communication. they are most general way of communication as shown in Figure 2. Wired communication refers to transmission of data by wired based technology. There are three major types of wired communication: (i) Twisted pair in this type pair of copper wire twisted, it is least expensive type of LAN. One wire carry signal other wire is grounded .(ii) Coaxial cable consists of inner conducted wire surrounded by insulation called dielectric it consist of conducted and non-conducted jacket. (iii) Fibre optic cable(Optical fibre) is basically consists of glass threads which is capable of transferring the data, it also can transfer the data through light beam.

1.1 Adavntages of wired communication

1. Very reliable type of communication.
2. High speed in transferring of data.
3. Higher protection from outside attack.

1.2 Disadavntages of wired communication

1. It cannot be used on devices based on wireless communication.
2. Location is already fixed so, there is only limited area for user.

Wireless communication is a type of data communication that can be transfer data without any wire or other type of fibre. It generally works through electromagnetic signals that can be broadcast by enable devices. Different type needs different designs of architecture of elements.

2.0 Different Forms of Wireless Communication

2.1 Radio wave

Frequency range lie between 500 kHz to 1GHz. Radio wave is a type of wireless communication in which data signal transformed into electromagnetic radiation for further transmission. Wavelength of radio wave is greater than infrared wave. As shown in figure 3.

**Department of Elecrtical, Electronics and Communication Engineering, The NorthCap University, Gurugram, Haryana, India*
***Corresponding Author: Department of Elecrtical, Electronics and Communication Engineering, The NorthCap University, Gurugram, Haryana, India (E-mail: nareshkumari@ncuindia.edu)*

2.2 Micro wave

Frequency range lie between 1GHz to 300GHz. Information is to be put into a micro wave and sent through the air to a recorder. It has a wide bandwidth and multiple channels available in microwave. As shown in figure 4.

2.3 Infrared Wave

Frequency range lie between 3GHz to 400 tera Hz . It uses infrared light to send the data. It is common in Personal Digital Assistant (PDA's) but it will not able to penetrate the walls. It also used in TV remote.

It work well for a small data and smaller area of transmission. As shown in figure 5.

2.4. Satellite communication

Satellite communication employs Line Of Site(LOS) for radio transmission over a wider range. It offers a band coverage over the ocean can handle a bulk of data for long distance telecommunication. It can build a platform between any location on earth by varying the positions of receiver and transmitter. As shown in figure 6.

2.5 Adavntages of wireless communication

1. Location: By the use of wireless communication we can set location by our choice, hence the area of transferring the data increases.
2. Radio wave transmission: The radio wave transmission is cheap and good for long distance data transmission.
3. Micro wave transmission: The micro wave transmission has wider bandwidth and multiple channels are available.
4. Infrared wave transmission: It is the cheapest way of transmission and good for short distance transmission.

2.6 Disadavntages of wireless communication

1. Bandwidth: Bandwidth is a parameter that suffer in wireless communication such as radio wave has a limited bandwidth and infrared wave has a shorter bandwidth.
2. Security: Wireless signal can be accessed by any other computer within the range of network so security can be varied in such case.
3. Speed: Wireless networks is 10 times slower than wired networks.

3.0 Threats and Solutions

1. Security: Security of a wireless communication is a major issue to solve. There are some steps of solution of this factor:-
   a) Use stronger encryption.
   b) heck for rogue Wi-Fi access points.
   c) Use secure WPA password and a VPN.
2. Capacity: We cannot transmit lot of data via wireless communication system. There are some steps that can improve wireless communication capacity:-
   a) Adding cell sites is a effective approach but expensive too. It time consuming and increasingly prohibited.
   b) Adding sectors such as changing to more sectors such as 3 sectors to 6 sectors may increase a useful way to increase new cells.
   c) Improve air interference capability by the help of modulation or by adding carriers.
   d) Smart antennas are such adaptive antenna have many functions such as beamforming, interference nulling and constant modulus preservation.

4.0 Evaluation of Laser Commication Technology

4.1 1990-2000

In October 1989, Galileo probe firstly launched from Kennedy space centre , Florida and then on 10th February it passed on Venus after that it firstly passed on earth by 8th December whereas the first successful one way detection laser light in 1992.

4.2 2001-2010

ARTEMIS(Advanced Relay and Technology Mission Satellite) of European Space Agency(ESA) become the first to have laser data connection in November 2001 by an optical data transmission link.

Spacecraft messenger which was carrying instrument Mercury Laser Altimeter become the first to record the two way distance of communication in May 2005.

4.3 2014.

European Space Agency (ESA) become the first ever space agency in November,2014 for using gigabit laser communication.

They also claim that their design may get up to the mark of 7.2 Gb/sec in future as they had the fastest link used at that time.

4.4. 2016.

Project loon was started in 2011 to provide internet access in rural areas. This project was firstly established in California in 2013. Later on Google took the responsibility to refine the project and hence Google X established.

In February,2016 it achieved the first stable laser communication over the distance of 100 km. The stable connection run for many hours with data rate of 155 Mbit/s.

4.5. 2018

Facebook Aquila from its connectivity lab become first to achieve air to ground connection in both the directions in June,2018. 10 Gbit/sec was the achieved data rate. The tests were executed from a conventional Cessna aircraft in 9 km range to the optical ground station.

4.6 Under water laser communication

Not only fibre optic communication and telecommunication underwater communication is like a fuel to modern day technology. In today's world the new technologies lying upon eighter light or sound for communication purposes.

Communication between ships to submarine, submarine to submarine, satellite to submarine suffers from various drawbacks such as rate of data transmit, reflection on multiple paths, transmission for smaller ranges as they have electromagnetic wave transfer instead of radio wave communication.

Blue-green laser is highly used in underwater communication system to penetrate sea and it cannot be adsorbed by the sea. It can travel to kilometres by window effect.

5.0 Working and Future Scope of Laser Communication

5.1 Laser communication

Laser stands for "Light Amplification by Stimulated Emission of Radiation". Laser communication is a direct link where source of light (laser) is modulated for data communication. Laser leams are used to transmit data. No fibre is used only a wireless technology.

It is used in long distances such as between two planets.

Laser Communication Terminals(LCTs) are capable of both transmitting as well as receiving of data.

5.2 Working

The principal of laser communication is based on the process of "Amplitude Modulation". In this process the Amplitude of the carrier wave (laser beam) is diverse in accordance to the instantaneous amplitude of the input signal (audio signal) keeping frequency and phase constant.

5.3 Applications

5.3.1. Commercial use

Facebook , Google , Space X and various other types of Multi National Company(MNC's) are working on technology of laser communication. Many researchers organising a series of start-ups working on laser communication. Nowadays commercial applications such as connections among the satellites over oceans and high altitude platforms to built high performance wide range of optical networks.

5.3.2. Medical use

Various type of laser surgeries are now available that utilize ultra-fast high intensity laser processing of tissue.

(a) X Ray: Ultra-fast x ray radiography in medical. A computer based tomography(with the help of high electromagnetic radiation X rays can display the inside structure of any solid body such as human body) can turn these x-ray image into 3D image.

(b) Lithotripsy: Technique for fragmentation of urinary and biliary stone for past few decodes

(c) Oncology: Used in treatment of cancer and tumours.

6.0 Communication Methods Representation

Fig 1: Communication Process

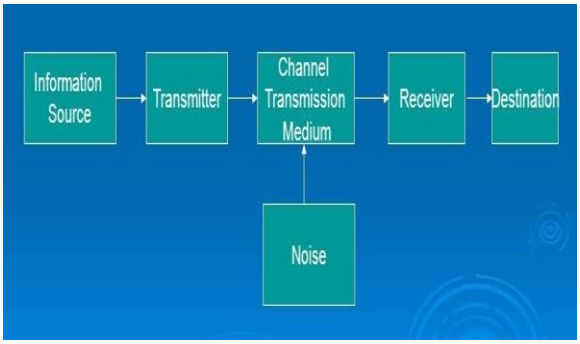


Fig 2: Mode of Communication

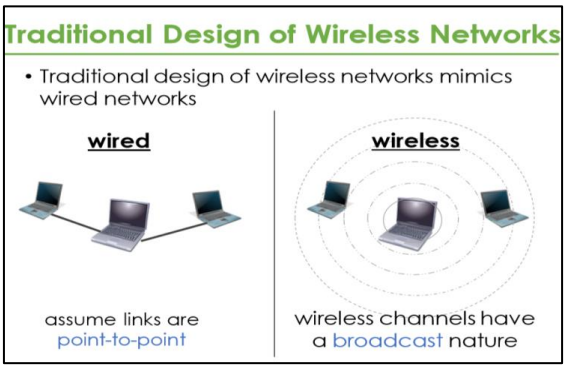


Fig 3: Radiowave

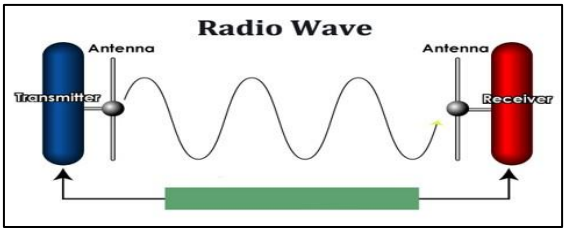


Fig 4: Microwave

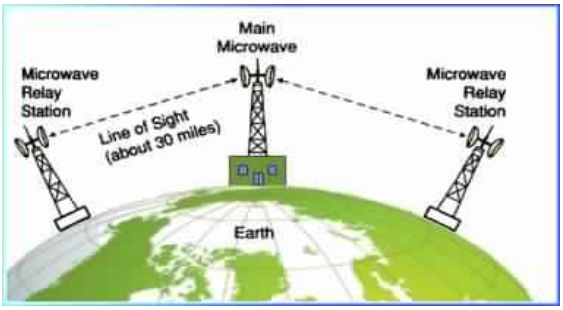


Fig 5: Infrared Wave

6.1. Military use

Laser technology is highly praised by military worldwide. Laser devices achieved a great success as they have a greater accuracy that include range finders which helps to calculate distance and range to achieved a desired target. Laser Guided Bombing(LGB) has a greater accuracy than the unguided bombing.

Smart bombs are designed either for ground based missiles or for aeroplanes by throwing a low power laser at desired destination. In 1972 during the war of Vietnam military first used laser bomb but it was completely executed in 1991 during Persian war. In 2006 in used it's first laser bomb by Indian Air Force Sudarshan laser bomb

Fig. 6 Satellite communication

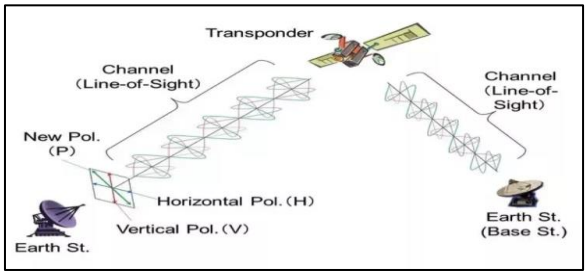
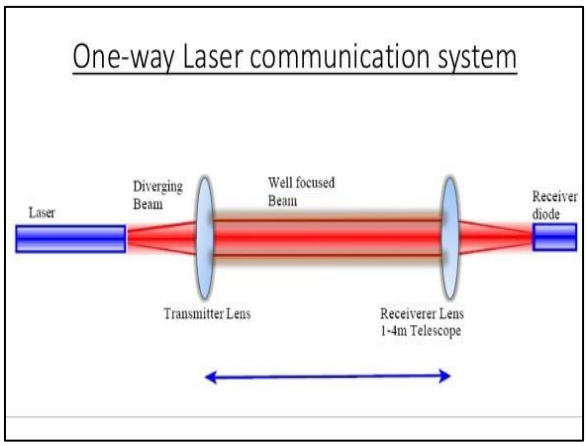


Fig 7: Laser Communication



7.0 Conclusions

In the conclusion, communication may break down as result of many communication barriers that may be held between the sender and receiver. But barriers can be removed by various techniques such as modulation. Technologies like Satellite communication and Laser communication and underwater communication allow the user to transfer the data for a wider range of area. Laser communication is widely accepted by the world. Various MNC's like Google, Facebook, NASA etc are still working on this. Enhancing the technologies in communication saves time, money and enhancing

the security. Laser technology has various applications in medical, Telecommunication, satellite communication, military and various commercial use.

References

[1] Walter R Leeb. Space Laser Communications: Systems, Technologies, and Applications, Gusshaus strasse 25/389, A-1040 Wien, Austria.

[2] GM Padayattil, D Poly. Highly Efficient Free Space Laser Communication, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 4(4), 2015.

[3] Vikrant, A Kumar, RSJha. Comparison of Underwater Laser Communication System with Underwater Acoustic Sensor Network, Int J Sci & Eng Res., 3(10), 2012.

[4] PM Ingale, RT Murade. Underwater Wireless Communication for Monitoring Applications of the Ocean Environment" International Journal For Advance Research In Engineering And Technology, 1(3), 2013.

[5] M Subha, Sivisona, Manasa, KS Divya, Savitha. Technologies Used In Underwater Wireless Communication, International Journal of Innovative Research in Computer and Communication Engineering, 5(6), 2017, 91-95

[6] JN Pelton, AUM Rae, KB Bhasin, CW Bostain. Global Satellite Comm. Technology and System, WTEC Report, ITRI, Maryland, USA, 1998.

[7] Sakshi Taaresh Khanna, Kamal Sharma. Laser tech. improvising wireless comm.: A comprehensive study on laser communicator, IOSR Jour. of Computer Engineering**,** 19(4), 2017**.**

[8] S Chaudhary. Wireless Communication improvement using laser: A comprehensive study, International Research Journal of Engineering and Technology, 5, 2018.

[9] Mohmd. Kamel Khawaja. Laser based audio communication system, International Journal of Engineering Sciences & Research Technology, 4(5), 2015.

[10] D Misra, DK Misra. Satellite communication advancement, issue, challenges and applications, International Journal of Advanced Research in Computer and Communication Energy, 2(4), 2013.

[11] E Kewlani. Laser communication: Shedding Some Light. International Journal of Research in Science and Engineering 2 (9), 2013, 1-3.

[12] S Nag, J Gibbs. Laser Communication System designed for the Google Lunar X Prize: IEEE Aero-space Conference Proceedings, https://www.researchgate.net/publication/224229043, 2011