

## Analog and Digital Communication

Communication Systems employing electrical signals to convey information from one place to another over a pair of wires provided an early solution to the problem of fast and accurate means of long distance communication. Today communication enters in our daily lives in so many different ways that it is easy to overlook the multitude of its facets. The Mobile phones at our hands, the radio and the television which are the basic and necessary part of our life are capable of providing rapid Communication from every corner of globe. Here in this section, Analog and Digital Communication, which are the major mode of communication are discussed with explanation of Analog Communication, Digital Communication and its advantages, disadvantage in details.

### **Analog Communication**

In Analog Communication, the message or the information to be transmitted is analog in nature. This analog message is obtained from the source such as speech, video, audio etc. Message signal in this case are modulated at high carrier frequency inside the transmitter in order to produce modulated signal. This modulated signal is then transmitted with the help of transmitting antenna to travel across the transmission channel.

### **Basic Analog Communication System**

At the receiver, this modulating signal is received and processed for the recovery of original signal. The following figure will represent the Basic Analog Communication System, which helps in explaining the concept in a more easy and prescribed way.

Now a days, all Analog modulation, Frequency Modulation radio transmission and Television transmission are comes under the example of Analog Communication.

### **Digital Communication**

In digital communication, the message signal are transmitted in digital form that means digital communication involves transmission of data or information in digital form.

The overall purpose of these systems are to message or or sequence of symbols that are coming out from the source to the destination point at a very high data rate and accuracy as possible. The source and destination points are physically separated in the space and a communication channel is used to connect the source and the destination.

### **Model of a Digital Communication**

**Discrete Information:** In case of digital modulation, the information source produces a message signal which is not continuously time varying signals rather the message signal is intermittent with respect to the time factor. The output of discrete information source such as Teletype or the numeric output of a computer consisting a sequence of discrete symbols.

**Source Encoder and Decoder:** The symbols produced by information source are given to source encoder. These symbols are for direct transmission. They need to first converted into digital form by the Source Encoder. This Encoder assign code words to the symbol. The receiver side these signal are encoded by the use of Source decoder to obtain the signal in desired form.

**Channel Encoder and Decoder:** After converting the message signal into binary sequence by the source encoder , the signal is ready to transmit through the channel. The communication channel adds noise and interference to the signal being transmitted. To avoid these type of error Channel encoding is done. Channel Encoder add some redundant bits(binary) to the input signal.

Channel Decoder at the receiver is thus able to reconstruct error free accurate bits and thus reduce the effect of channel noise and distortion at the receiver end.

**Digital Modulator and Demodulator:** Modulation and demodulation of digital signal are done with the help of Digital Modulator and Demodulators respectively.

**Communication Channel:** The connection between the transmitter and the receiver is established through a communication channel. The communication can take place through wire lines, wireless or fibre optical channels. Other media such as Optical disks, magnetic tapes and disks ets may also come under the category of Communication channel.

#### **Advantages and Disadvantages of Digital Communication:**

##### **Advantages:**

- In digital Communication, the speech, video and other data may be merged and transmitted over a common channel using multiplexing technique.
- The digital Communication system are simpler and cheaper because of advancement made in the IC technologies.
- Channel Coding is used in digital Communication that why it reduces the amount of errors in the detector and correct them in the receivers.
- As the transmitted signals are digital in nature thus the amount of interference is controlled in this form of Communication.

##### **Disadvantages:**

- Due to Analog to Digital Conversion the data rate become high. Therefore more transmission bandwidth is required for digital communication. This is the major disadvantage of Digital communication.
- Synchronization is required in digital communication during the process of synchronous modulation.