

University Institute of Engineering & Technology CSJMU

KANPUR

Department of Electronics & Communication Engineering

Course Name- Digital Communication (ECE-S401)

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Topics Covered:

- 1) Introduction of communication**
- 2) Block Diagram of Digital Communication**
- 3) Advantages & Disadvantages of Digital Communication**

Communication:

Communication is the process of establishing connection or link between two points for information exchange.

Depending upon the message signal signal, Communication can be classified as:

- 1) Analog Communication
- 2) Digital communication

1) Analog Communication :

It is that type of communication in which the message or information signal to be transmitted is analog in nature.

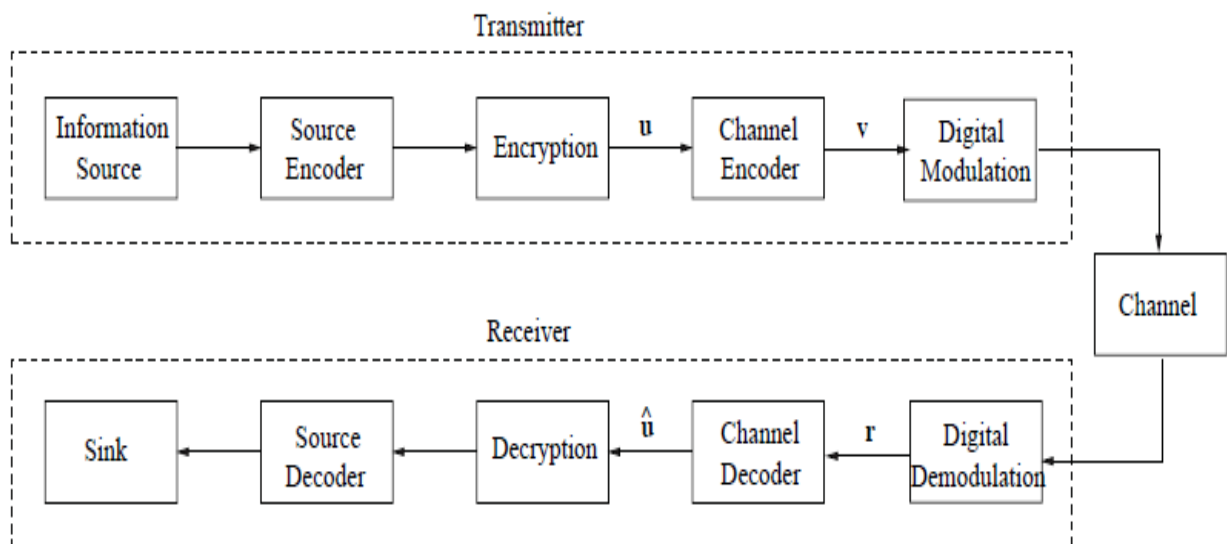
This means that in analog communication the modulating signal is an analog signal.

2) Digital communication :

It is that type of communication in which the message or information signal to be transmitted is Digital in nature.

This means that in Digital communication involves the transmission of information in digital form.

Block Diagram Of Digital communication System:



Source Coding:

Function: To minimize the number of bits per unit time required to represent the source output.

This process is known as source coding or data compression

Examples: Huffman coding, Lempel-Ziv algorithm.

The output of the source encoder is referred to as the information sequence

Encryption:

Function: To make source bits transmission secure.

This process of converting source bits (message text) into a source stream that looks like meaningless random bits of data (cipher text) is known as encryption.

Examples: Data Encryption Standard (DES), RSA system.

Channel Coding:

Function: To correct transmission errors introduced by the channel.

The process of introducing some redundant bits to a sequence of information bits in a controlled manner to correct transmission errors is known as channel coding or error control coding.

Example: Repetition code, CRC codes.

The encoded sequence that is the output of the channel encoder is referred to as codeword.

Digital Modulation:

Function: To map the code words into waveforms which are then transmitted over the physical medium known as the channel.

Examples: Amplitude Shift Keying (ASK), Phase shift keying (PSK), quadrature amplitude modulation (QAM).

Channel:

The physical transmission medium; it can be wireless or wireline.

Corrupts transmitted waveforms due to various effects such as noise, interference, fading, and multipath transmission.

Example: Additive white Gaussian noise (AWGN) channel.

Demodulation:

Function: To convert received noisy waveform to a sequence of bits, which is an estimate of the transmitted data bits. This is known as hard demodulation.

If the demodulator outputs are unquantized (or has more than two quantization

levels), this is known as soft demodulation. Soft demodulation has significant improvement over hard demodulation

Channel Decoding:

Function: To estimate the information bits \hat{u} and correct the transmission errors.

Decryption:

Function: To recover the plain text from the cipher text with the help of key. It is in the key that the security of a modern cipher lies, not in the details of the cipher.

Source Decoding:

Function: To reconstruct the original source bits from the decoded information sequence. Due to channel errors, the final reconstructed signal may be distorted.

Advantages of Digital communication:

- 1) The digital communication system has high noise immunity.
- 2) It has many advantages in storing and processing various data and information.
- 3) The digital communication system is best in the view of the economy point.
- 4) It has the advantage of signal regeneration.
- 5) Also, for security purposes, the digital communication system is used nowadays.

Disadvantages of Digital communication:

1. There is a requirement for synchronization in the case of synchronous modulation.
2. There is a sampling error.
3. The most common limitation of digital communication is that it requires more transmission bandwidth. It is due to the higher data rate because of analog to digital conversion.