Sri SAI RAM ENGINEERING COLLEGE
INSTITUTE OF TECHNOLOGY
West Tambaram, Chennai - 44

Sairam INSTITUTIONS

SAIRAM DIGITAL RESOURCES

YEAR II

SEM III

EC8394

ANALOG AND DIGITAL COMMUNICATION

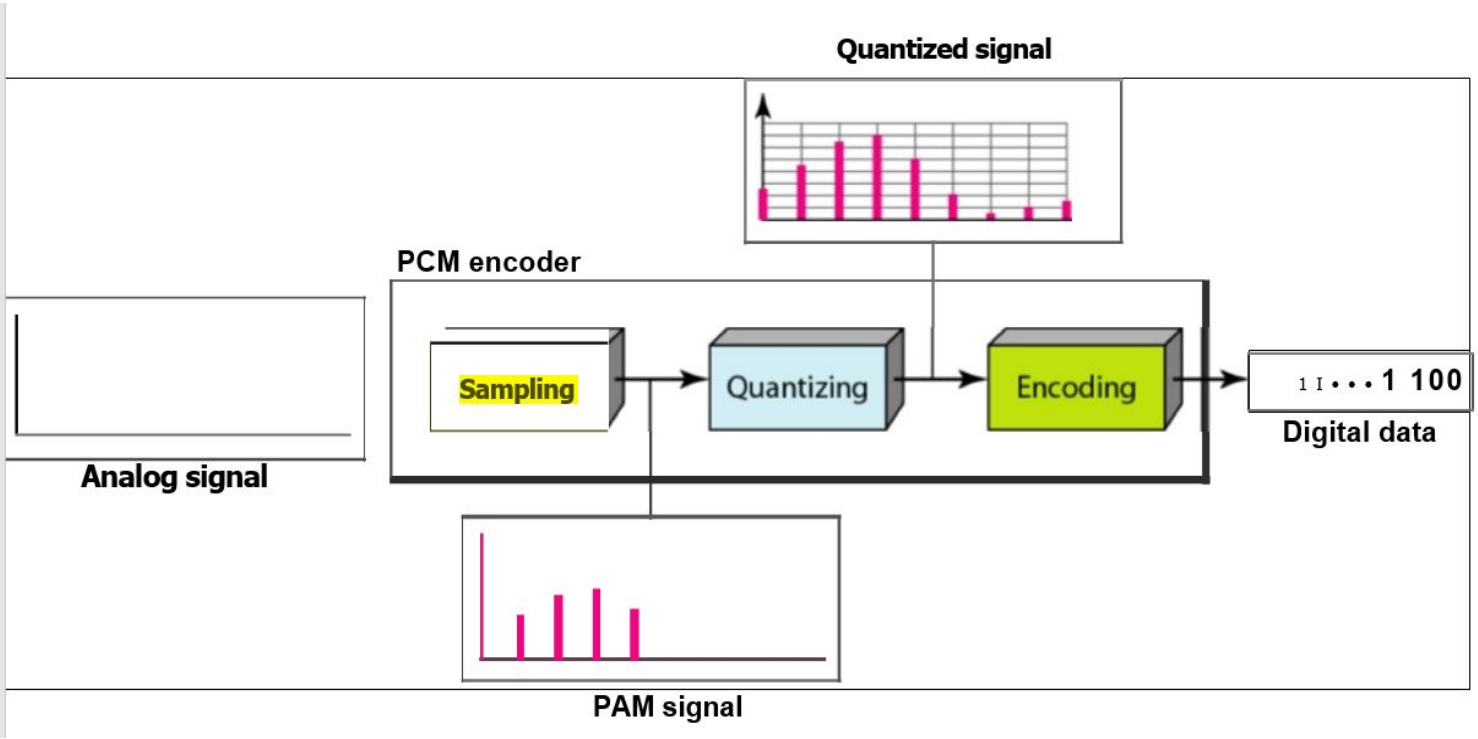
UNIT 2 PULSE AND DATA COMMUNICATION

- 2.1.3 PULSE CODE MODULATION

ELECTRONICS & INSTRUMENTATION ENGINEERING

- Introduction
- Block diagram of PCM
- PCM processes
- PCM standards
- Bit rate and bandwidth requirements of PCM
- Advantages
- Disadvantages
- Application

- **Analog voice data must be translated into a series of binary digits before they can be transmitted.**
- **With Pulse Code Modulation (PCM), the amplitude of the sound wave is sampled at regular intervals and translated into a binary number.**
- **The difference between the original analog signal and the translated digital signal is called *quantizing error.***


Quantized signal
PCM encoder
Sampling
Quantizing
Encoding
1 1 • • • 1 100
Digital data
Analog signal
PAM signal

Filtering

Sampling

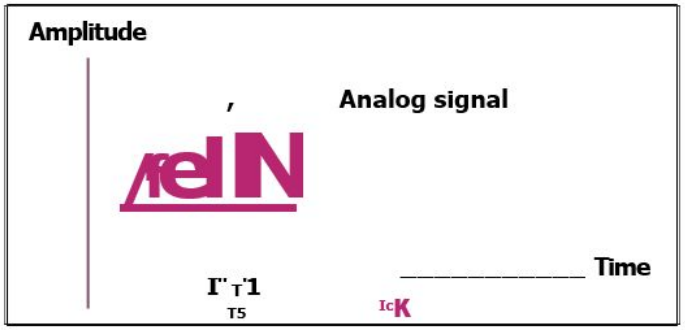
Quantization

Encoding

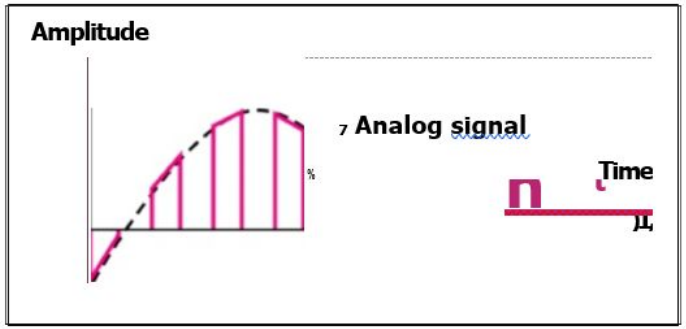
- Analog signal is sampled every T_s see.
- T is referred to as the sampling interval.
- 1/Ts called the sampling rate or sampling frequency.

There are 3 sampling methods:

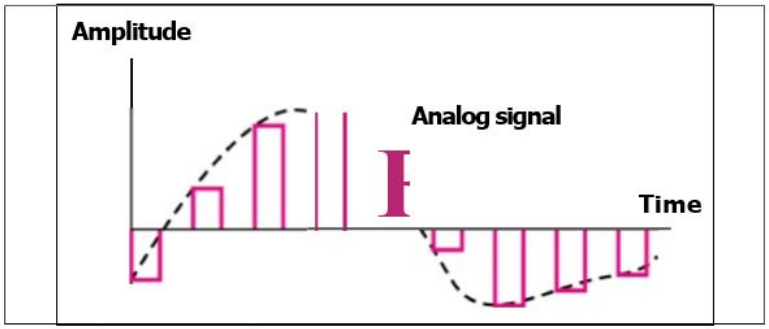
- Ideal - an impulse at each sampling instant
- Natural - a pulse of short width with varying amplitude
- Flattop - sample and hold, like natural but with single amplitude value



a, Ideal sampling



b. Natural sampkg



c. Flat-top sampling

- The process of measuring the numerical values of
- the samples and giving them a table value in a suitable scale
- D The finite number of amplitude intervals is called the quantizing interval' like quantizing interval no.1 is 10-20mV; 2 is 20-30mV etc. in a case of 1V signal.
- Linear quantizing is where the quantizing intervals are of the same size

- Quantization intervals are coded in binary form, and so the quantization intervals will be in powers of 2.
- In PCM, 8 bit code is used and so we have 256 intervals for quantizing (128 levels in the
- Positive direction and 128 levels in negative direction)

- The deviation between the amplitude of samples at the transmitter and receiving ends
- In linear quantization, the distortion is more and to decrease the distortion, the no. of steps in the given amplitude range has to be increased.
- Due to BW limitations, more quantum levels in small amplitude region are planned results to
- Non linear (uniform) quantization

- There are two standards of pcm namely

1) The European Standard

2) The American Standard

- They differ slightly in the detail of their working but the principles are the same.

European pcm = 30 channels

North American pcm = 24 channels

Japanese pcm = 24 channels

In India we follow the European pcm of 30 channels system working.

- **Uniform Transmission Quality Compatibility of different classes of Traffic in the Network**
- **Integrated Digital Network increased utilization of Existing Circuit**
- **Low Manufacturing Cost**
- **Good Performance Over Very poor Transmission Paths**

- Large Bandwidth required for Transmission
- Noise and crosstalk leaves low but rises attenuation
- An integrated Digital network can only be realized be a gradual extension of Noise

https://www.youtube.com/watch?v=HlGJ6xxbz8s