

PULSE CODE MODULATION (PCM):

PCM is an analog to digital converter where the information contained in the instantaneous samples of an analog signal are represented by digital codes as a bit stream.

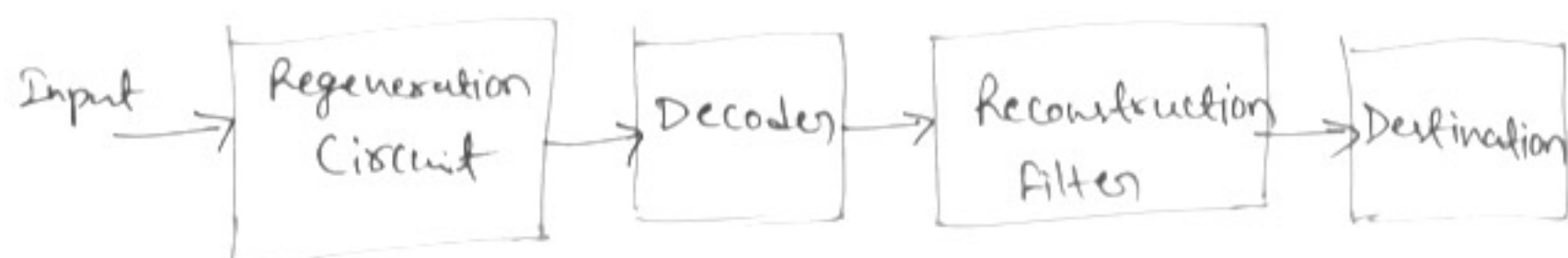
Block diagram:



(a) PCM Transmitter



(b) Transmission path



(c) Receiver

PCM Transmitter:

In practice the low pass filter (pre-coding filter) is used before sampler in order to limit the frequency greater than ' f_m ' Hz. Hence message signal is bandlimited to ' f_m ' Hz.

Sampler:

The Incoming message signal is sampled with a train of narrow rectangular pulses with sampling rate $f_s \geq 2f_m$. (i.e. above Nyquist rate) to avoid ~~at~~ ALIASING.

Quantizer:

The sampled signal is fed to the quantizer. The quantizer approximate each input sample to a nearest predefined voltage level.

The output of quantizer is discrete time, discrete amplitude signal known as "Quantized signal".

Encoder:

The ~~same~~ quantized samples are ~~then~~ converted into digital codewords in Encoder. The process of encoding involves allocating some digital codes to each sample quantization level. These digital codes are transmitted as bit stream.

Regenerative Repeater:

(31)

The PCM signal is reconstructed by means of a regenerative repeater located at sufficiently closed spacing along the transmission path.

The regenerative networks are used at intermediate points between transmitter and receiver in order to boost up the pulse amplitude.

PCM Receiver:

The first operation in the receiver to generate the received pulses.

Decoder:

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Decoder :

~~The first operation~~

The decoder converts binary coded signal to a approximated pulses of discrete magnitude.

Reconstruction filter :

The final operation in the receiver is to recover the original analog signal. This is done by passing the decoder output through a LPF. The output of low pass filter is an analog signal.

Advantages of PCM :

- 1) Relatively inexpensive digital circuitry is involved in PCM.
- 2) PCM signals can be multiplexed and transmitted over a common high speed communication link.
- 3) In long distance transmission, clean waveforms can be regenerated using repeaters.
- 4) The noise performance of digital system is superior to that of an analog system.

Pulse Degradation In Transmission Medium

