PCM (Pulse Code Modulation)

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Pulse Code Modulation

PCM

a message signal is represented by a sequence of coded pulses,
which is accomplished by representing the signal in discreteform in both time and amplitude

- Sampling
- Quantization

Operations

Operations in the transmitter

- low pass filter
- sampling
- quantization (nonuniform, compressing)
- encoding

Operations in the transmission path

- equalization
- timing
- decision making

Operations in the receiver

- decoding
- expanding
- reconstruction

Operations in the transmission path

- sampling
- quantization (nonuniform, compressing)
- encoding
  - given the discrete set of sample values
  - encoding process for a robust transmission over noise, interference, etc
  - code (a way representing *discrete set of values* as any arrangement of *discrete events*)
  - a code element / symbol (one of such discrete events)
  - a code word / character (a particular arrangement of symbols used in a code to represent a single value of the discrete set)
  - binary code (each symbol may be either of two distinct values)
  - bit (binary digit) (each code word consists of R bits - bits per sample)
  - bits per sample (a sample quantized into one of 256 levels may be represented by an 8-bit code word)

Operations in the transmission path

regnerative repeaters

- equalization
  - amplitude distortion
  - phase distortion
  - the transmission characteristics of the channel
- timing
  - the timing circuit generates a periodic pulse train from the received signal
  - for a renewed sampling of the equalized pulses
  - at the instants of time where the SNR ratio is a maximum
- decision making
  - threshold

cannot compensate

1. bit errors : the unavoidable present of channel noise and interference
2. jitters : deviated time spacing

Operations in the receiver

- decoding
  - regenerate (reshape)
  - regrouped into code words
  - decoded into a quantized PAM signal
- expanding
  - inverse to the compressing operation of the nonuniform quantization
- reconstruction
  - low pass reconstruction filter

source encoding strategy
an analog signal emitted by a source is converted into digital form

Reference

[1] S. Haykin, M Moher, “Introduction to Analog and Digital Communications”, 2ed