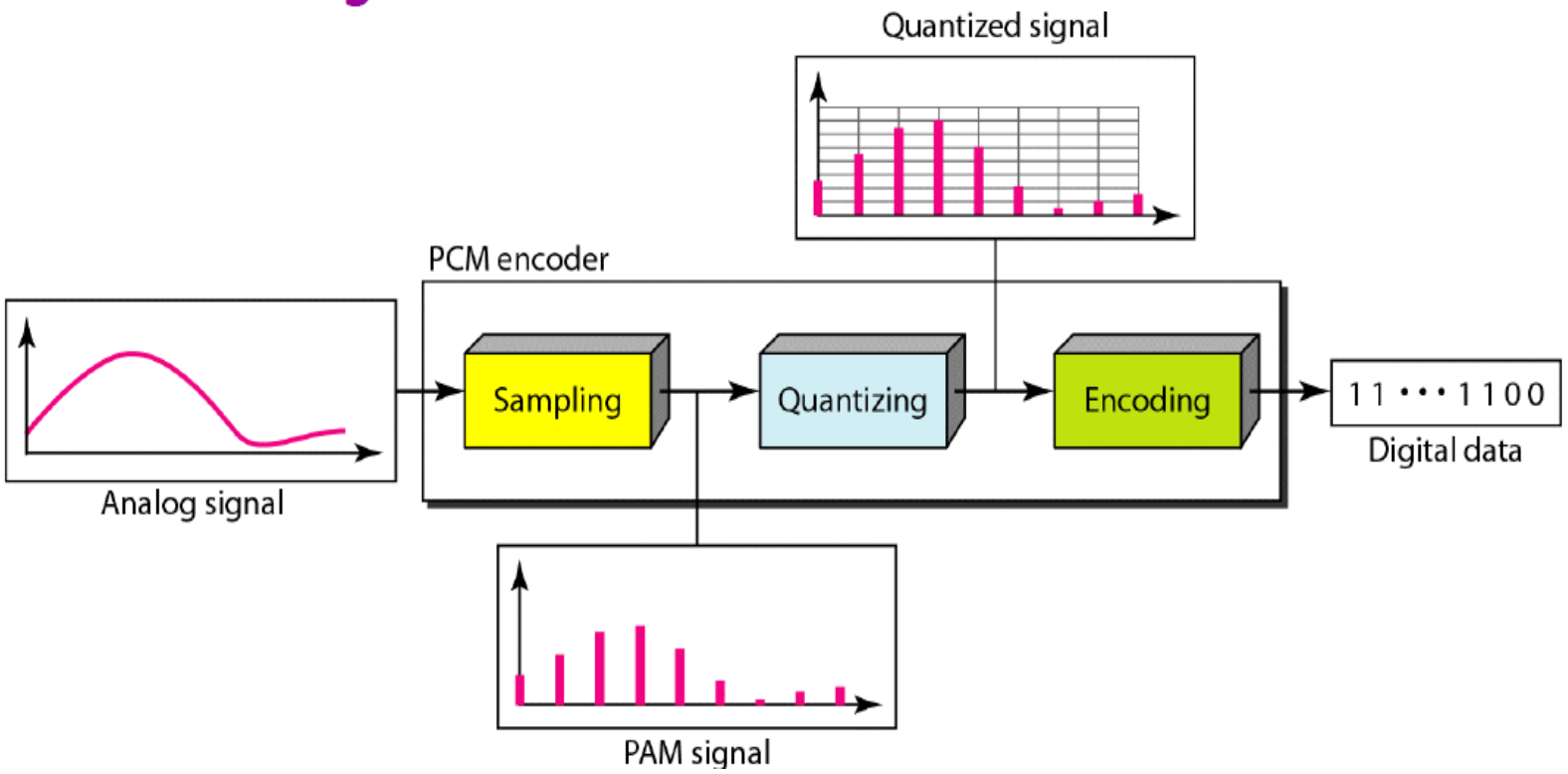
EE:450 – Computer Networks

Discussion Session #6

A/D Conversion

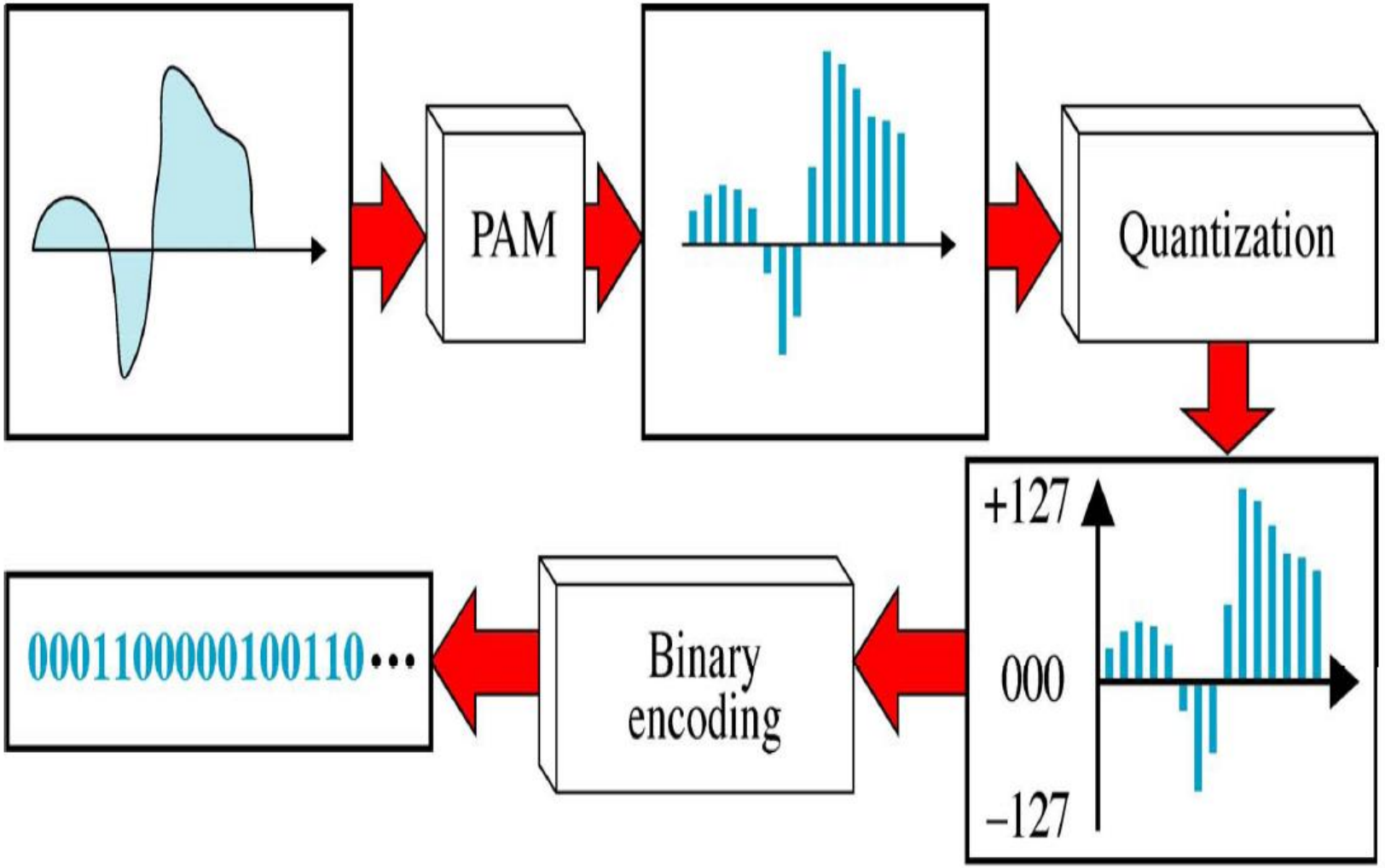
- Digitization consists of 3 processes
  - Sampling
  - Quantization
  - Encoding



Sampling/Quantization/Encoding

- If a signal is sampled at regular intervals at a rate higher than **twice** the highest signal frequency, the samples contain all the information of the original signal
- Voice signals are limited to below 4000Hz ⇒ Require **8000** sample per second
- The result, which is 8000 analog samples/sec are quantized to certain number of **allowable** levels. In practice, for telephony, 256 allowable levels
- Each quantized sample is encoded into 8 bits resulting in a **digital signal** of rate 64 Kbps

Analog to Digital Conversion (Cont.)

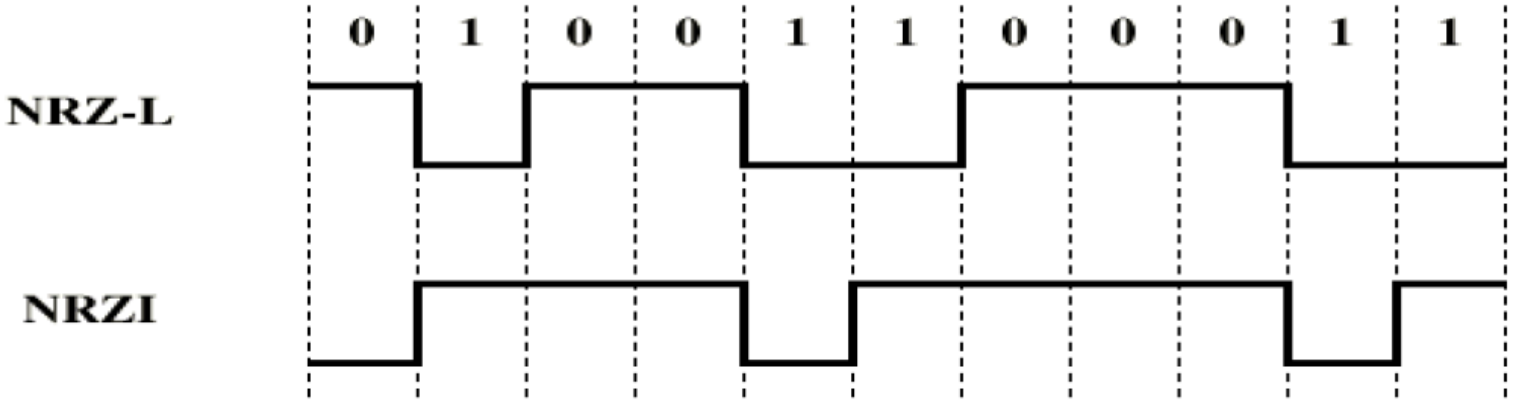


Line Coding

- Line coding is the process of encoding the binary string of bits by a digital/discrete-level signal suitable for transmission over the line
- Examples include:
  - NRZ-L : Non-Return-to-Zero Level
  - NRZ-I : Non-Return-to-Zero Inverted
  - Manchester/ Differential Manchester Coding
  - Many others…

Non Return to Zero Line Code

- NRZ: Two different voltages for 0 and 1 bits
- Voltage constant during bit interval
- e.g. Absence of voltage for zero, constant positive voltage for one. More often, negative voltage for one value and positive for the other
- NRZI: Non-return to zero inverted on ones

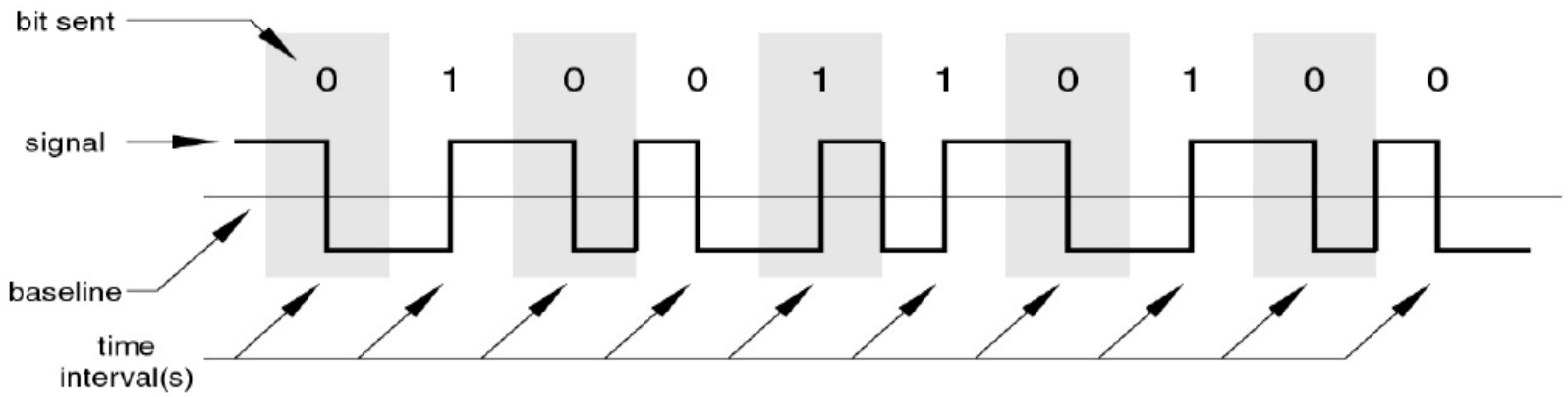


Manchester/Differential Line Code

- Manchester
  - Transition in middle of each bit period
  - Transition serves as clock and data
  - Low to high represents one
  - High to low represents zero
  - Used by IEEE 802.3
- Differential Manchester
  - Mid-bit transition is clocking only
  - Transition at start of a bit period represents zero
  - No transition at start of a bit period represents one
  - Note: this is a differential encoding scheme

Manchester/Differential Line Code

Manchester Encoding



Differential Manchester Encoding