SEB4233
Biomedical Signal Processing

Signal Acquisition

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Introduction

- Most of biomedical signal are currently recorded using computer and stored in digital format for further analysis.

- The process of converting continuous-time signal (analog) into discrete-time signal (digital) is called as analog to digital conversion (A/D).

- The reverse process of reconstructing an analog signal from its discrete-time samples is known as digital to analog (D/A) conversion.

Introduction

| Continuous-Time Signal → | A/D | → Discrete-Time Signal → | DSP | → Discrete-Time Signal → | D/A | → Continuous-Time Signal |

A/D: Analog-to-Digital Conversion
DSP: Digital Signal Processing
D/A: Digital-to-Analog Conversion

Analog to Digital Conversion

- There are three components in analog to digital (A/D) converter:
  - ➤ Continuous-to-discrete (C/D) converter
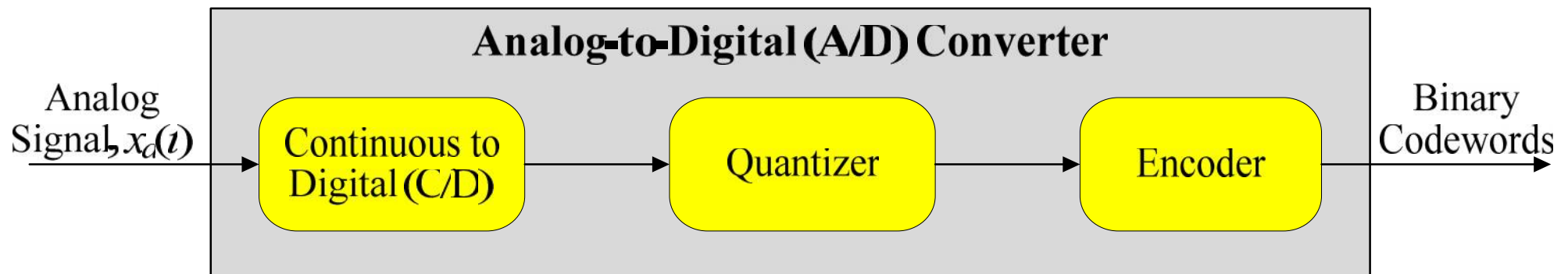 - ➤ Quantizer
  - ➤ Encoder

Figure : Three components of an analog to digital converter

Analog to Digital Conversion

- **Input**: a real value function denotes as $x_a(t)$ of a continuous variable, t which is time.

- **Continuous-to-digital (C/D) converter**: converts the $x_a(t)$ into a discrete-time sequence $x(n)$ by extracting the values of $x_a(t)$ at integer multiples of the sampling period, T_s:

$$x(n) = x_a(nT_s)$$

- **Quantizer**: maps the continuous amplitude into a discrete set of amplitudes.
  - The quantization process is defined by the number of bits and the quantization interval, Δ.

- **Encoder**: Produces a sequence of binary codewords.

Analog to Digital Conversion

Analog

Digital

Sampled

Quantized