

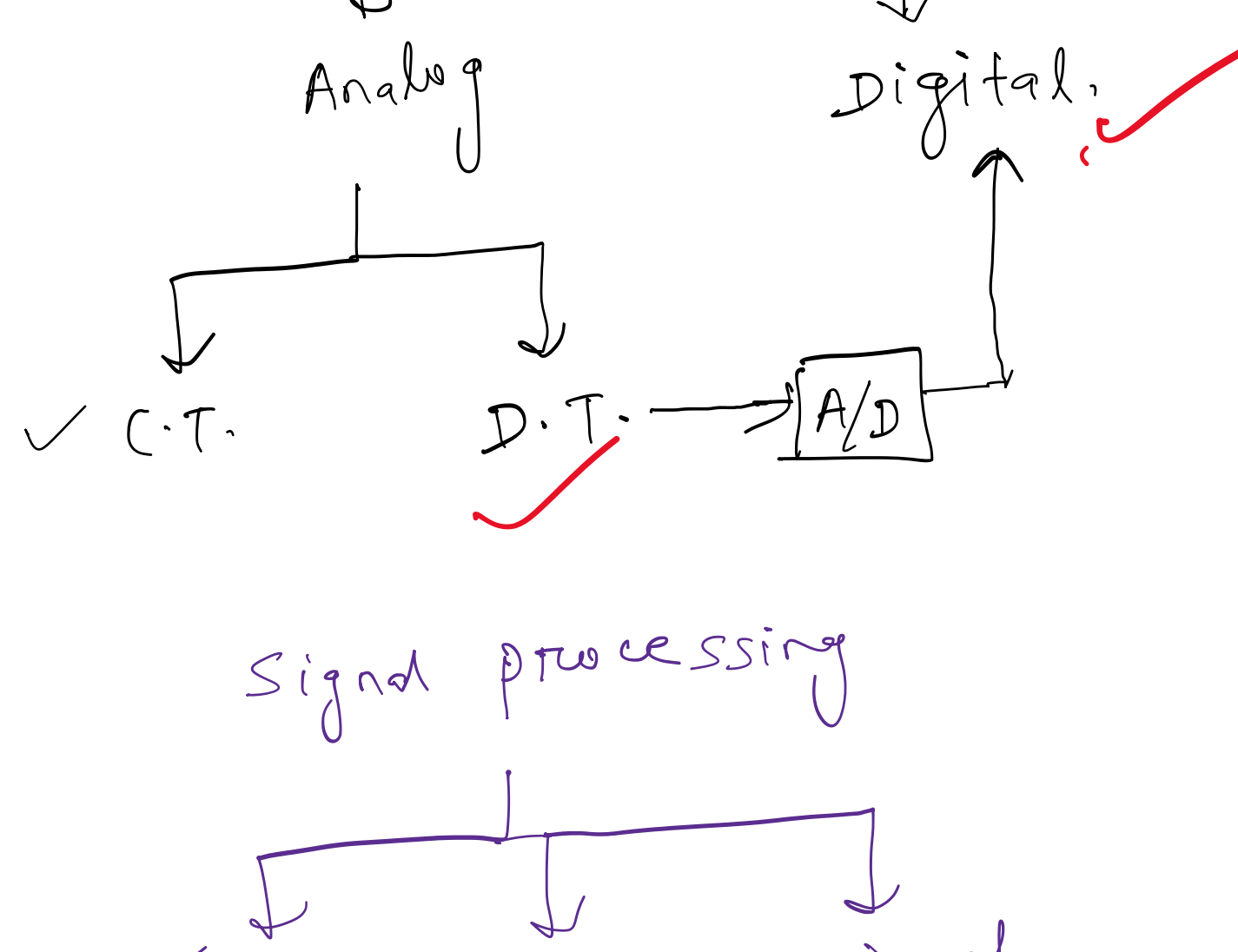
Signal:

- Function of independent variables, time, distance, position, temp. & pressure.
- Contains information.

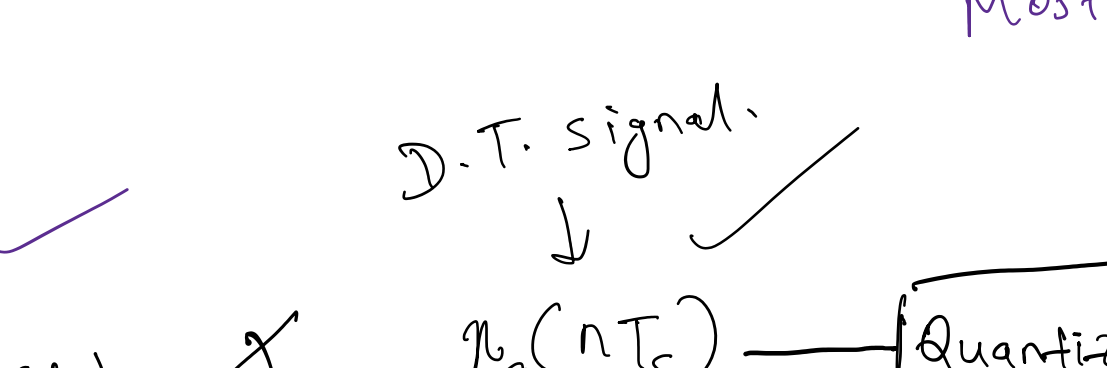
Signal $\begin{cases} \rightarrow 1D \\ \rightarrow \text{multi dimension.} \end{cases}$

1D \rightarrow speech. \rightarrow time ^{inde} variable.

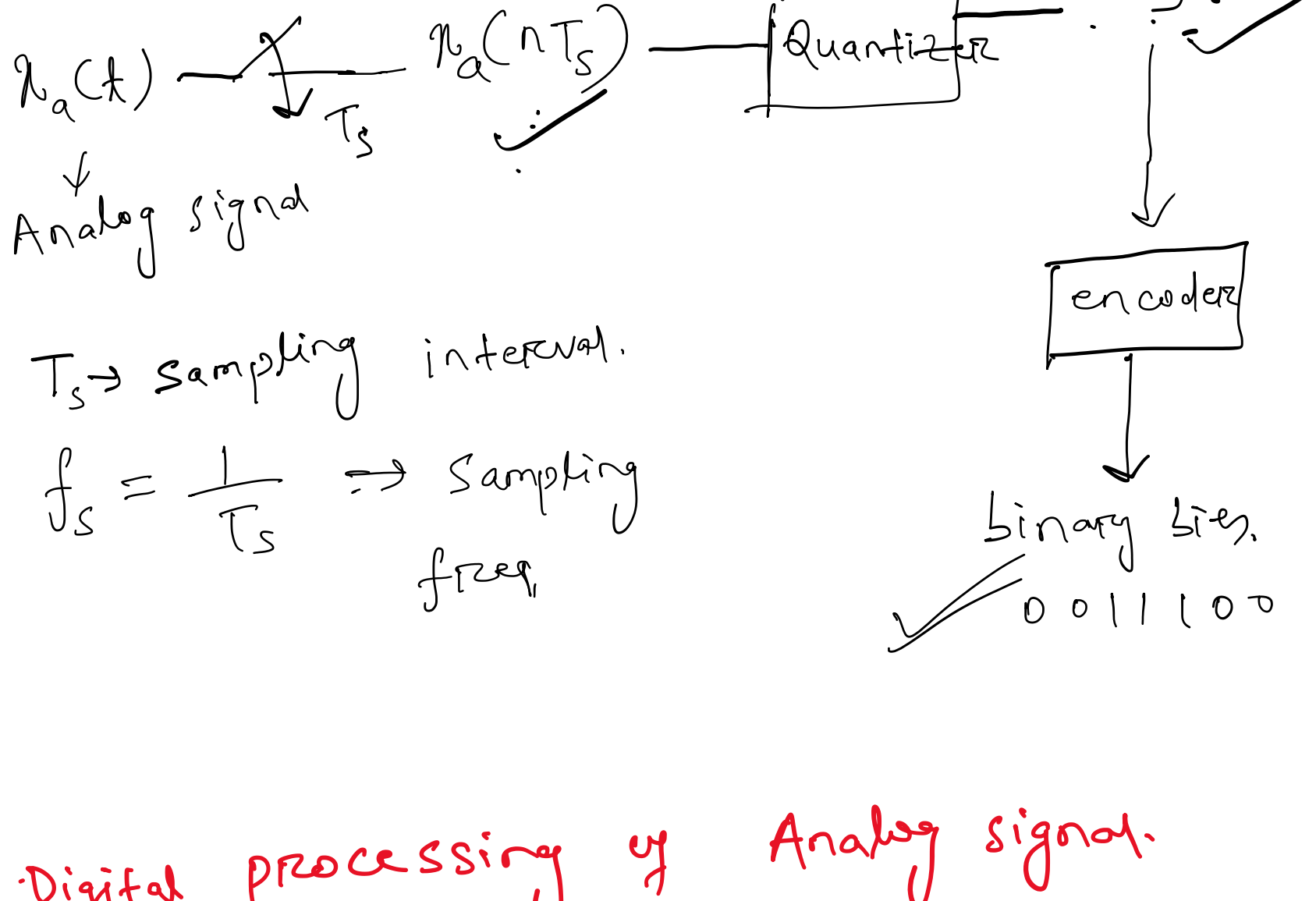
2D / 3D \rightarrow Image.



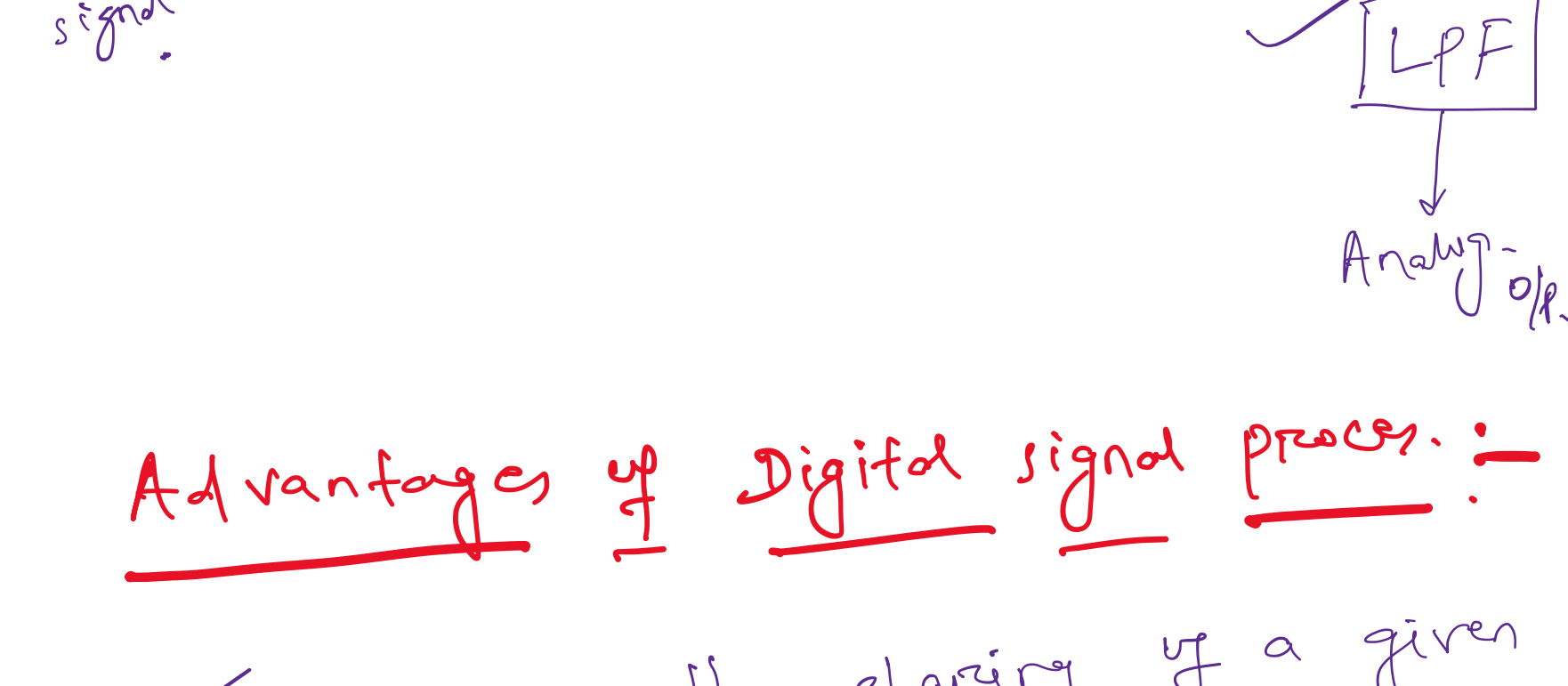
Signal processing



Most effective.

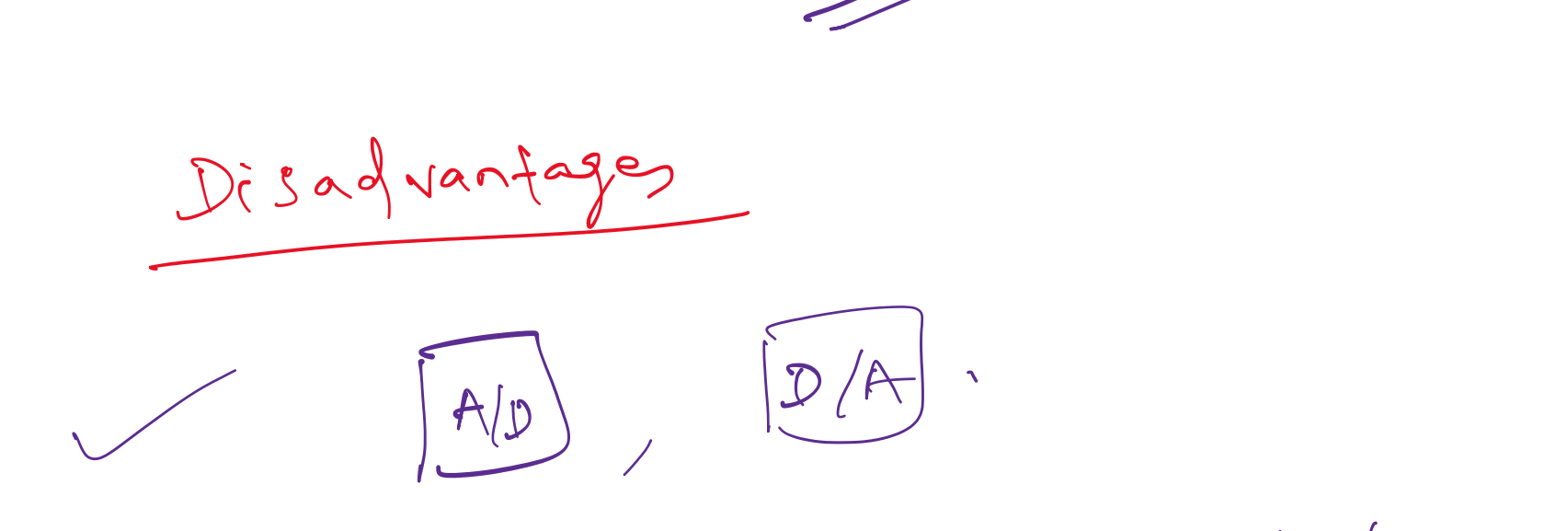


Digital processing of Analog signal.



Advantages of Digital signal process. :-

- 1) It allows the sharing of a given processor among a no. of signals by time sharing.
- 2) Adaptive filters \rightarrow updation of co-efficients
- 3) Can process low frequency signals.



Disadvantages

A/D, D/A.

\rightarrow complexity in the ckt. will be more.

Discrete-time Signal:

$x_a(t) \big|_{t=nT_s} = x_a(nT_s) = x[n]$

Discrete-time signal (D.T. Sequence).

$\{x[n]\} \rightarrow$ sequence.

$x[n] = \{ \dots -0.95 \quad -0.1 \quad 2.17 \quad 1.1 \quad 0.4 \dots \}$

D.T. signal with real-valued samples.

$\hat{x}[n] = \{ \dots -1 \quad 0 \quad 2 \quad 1 \quad 0 \dots \}$

Signal can be complex.

$x[n] = \{ \dots 1+j \quad 1-2j \quad 2-3j \dots \}$

Complex signal \rightarrow Addition of two real signals where one signal is orthogonal to another.

$x_1[n] = \{ \dots 1 \quad 1 \quad 2 \dots \}$

$x_2[n] = \{ \dots -1 \quad -2 \quad -3 \dots \}$

$x[n] = x_1[n] + jx_2[n]$

DT signal $\begin{cases} \rightarrow \text{Finite-length} \\ \rightarrow \text{Infinite-length.} \end{cases}$

Finite sequence.

$\{1 \quad 1 \quad 2 \quad 3\} \rightarrow \text{Length} = N = 4$

$\rightarrow n = 0 \text{ to } N-1$

$\{1 \quad 2 \quad 1 \quad 1 \quad 0\} \rightarrow N = N_2 - N_1 + 1$

$= 5$

$N_1 \leq n \leq N_2 \rightarrow \text{Length } N = N_2 - N_1 + 1$

Infinite-length.

\rightarrow right-sided signal.

Left sided

both sides.

Classification of Signal (Sequence)

Sequence (Signal)

Even odd. General

Even:

If $x_e[n] = x_e[-n]$.

then $x_e[n]$ is an even signal.

\rightarrow even signal.

Odd:

$x_o[n] = -x_o[-n]$.

then $x_o[n] \rightarrow$ odd signal.

$x_o[0] = 0$.

\rightarrow odd signal.

Books:

1) Digital Signal Proc. S.K. Mitra.

2) Discrete time signal proces. openh; shaffer.