DPCM.

* If a voice (or) video signal is sampled at a rate slightly higher than the Nyquist rate, then the resulting sampled signal is found to be exhibit a high correlation between adjacent samples ⟹ this high correlation is that in an average sense, the signal does not change rapidly from one sample to the next.

* When these highly correlated samples are encoded as in a std PCM systems, the resulting encoded signal contains redundant information.

* Now it is clear that symbols that are not absolutely essential to the T_x^{on} of inf are generated as a result of the encoding process.

Prediction:-

Knowing the past behaviour of a signal up to a certain point in time, it is possible to make some inference about its future values, ⟹ such a process is commonly called Prediction.

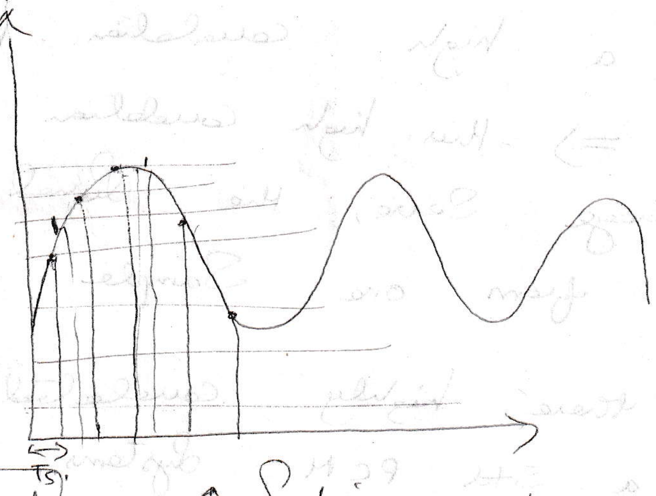
Delta modulation:-

PCM & DPCM ⟹ $\boxed{f_s \geq 2~~\omega~~}$

Sampling rate > Nyquist rate

Delta modulation

⇒ f_s Asynchronous → than PCM & DPCM



Delta mod

PCM

DPCM

↑ System

↓ bit rate reduction

Delta.

$$H = \begin{bmatrix} 1/4 & 1/2 & 1/4 \\ 1/2 & 1 & 1/2 \\ 1/4 & 1/2 & 1/4 \end{bmatrix} \quad \Rightarrow 2\tfrac{3}{4} + 1\tfrac{1}{4} = 4 \,//.$$

$\Rightarrow$ Scaling is 4 $\Rightarrow$ center pel is 1.

$$\begin{bmatrix} 1 & 0 & 7 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \quad 4 \cdot \begin{bmatrix} 1/4 & 1/2 & 1/4 & 0 \\ 1/2 & 1 & 1/2 & 0 \\ 1/4 & 1/2 & 1/4 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 7 & 0 \end{bmatrix} \qquad \begin{bmatrix} \; \end{bmatrix}$$

$$A_1 = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}. \qquad A_2 = \begin{bmatrix} \sqrt{2} & j \\ -j & \sqrt{2} \end{bmatrix}$$

orthogonal $\Rightarrow A^{-1} = A^T \Rightarrow A^{-1}A^T = I \,//.$

$$A_1^T = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}. \qquad |A_1| = \frac{1}{\sqrt{2}}(-2) = -\frac{\sqrt{2}\cdot\sqrt{2}}{\sqrt{2}} = -\sqrt{2}.$$

$$A_1^{-1} = \frac{1}{|A_1|}\left[\operatorname{adj} A_1\right].$$

$$= \frac{1}{(-\sqrt{2})} \begin{bmatrix} -1 & -1 \\ -1 & 1 \end{bmatrix}.$$

$$= \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}.$$

$\therefore A^{-1} = A^T$ hence it is orthogonal.

$$A^{-1} = A^{*T}$$

$$A_2 = \begin{bmatrix} \sqrt{2} & j \\ -j & \sqrt{2} \end{bmatrix} \qquad |A_2| = 2 + j. \qquad A_2^{*T} = \begin{bmatrix} \sqrt{2} & j \\ -j & \sqrt{2} \end{bmatrix}.$$

$$A_2^T = \begin{bmatrix} \sqrt{2} & -j \\ j & \sqrt{2} \end{bmatrix}. \qquad = \frac{1}{(2+j)} \,//$$

$$A_2^{-1} = \frac{1}{|A_2|}\left[\operatorname{adj} A_2\right] = \frac{1}{2+j} \begin{bmatrix} \sqrt{2} & +j \\ -j & \sqrt{2} \end{bmatrix}$$

(a)

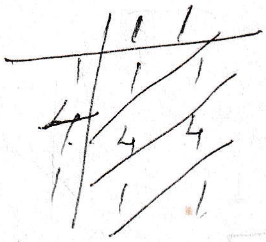
$$\begin{array}{ccc} 1 & 4 & 1 \\ 2 & 5 & 3 \end{array} \Rightarrow \begin{bmatrix} 1 & 2 \\ 4 & 5 \\ 1 & 3 \end{bmatrix}$$

$M_1 \times N_1$
3×2

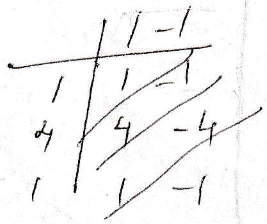
$$\begin{array}{cc} 1 & 1 \\ 1 & -1 \end{array} \Rightarrow \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

$M_2 \times N_2$
2×2

$(M_1 + M_2 - 1) \times (N_1 + N_2 - 1)$
$(3 + 2 - 1) \times (2 + 2 - 1)$
$(5 - 1) \times (4 - 1)$
4×3

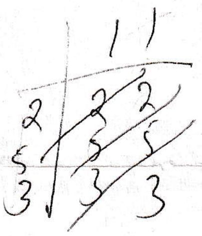


$\Rightarrow$ 1 5 5 1

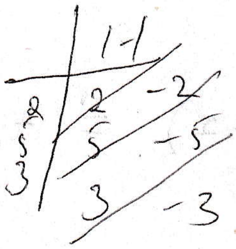


$\Rightarrow$

$$\begin{pmatrix} 1 & 3 & -3 & -1 \\ & & & \\ 2 & 7 & 8 & 8 \end{pmatrix}$$



$\Rightarrow$



$\Rightarrow$ 2 3 -2 -3

$$\begin{array}{cccc} 1 & 5 & 5 & 1 \\ 3 & 10 & 5 & 7 \\ 2 & 3 & -2 & -3 \end{array}$$

$y(m,n)$