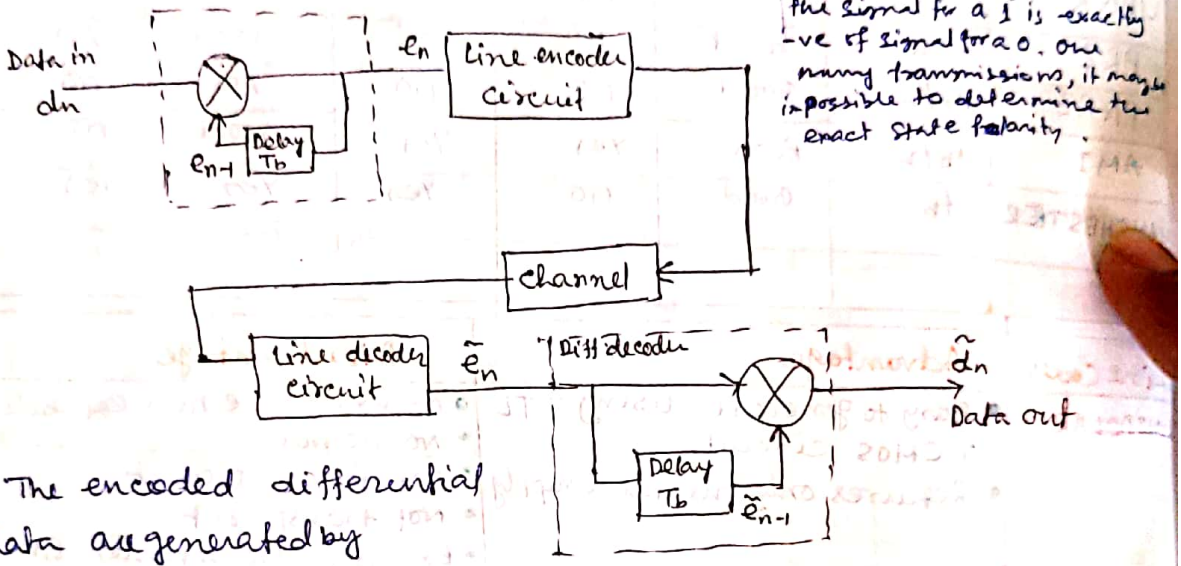
Differential Encoding: When serial data passed through many circuits along a communication channel, the waveform is often unintentionally inverted, to prevent this inversion of data is called differential encoding. Each digit in the encoded sequence is obtained by comparing the present input bit with the past encoded bit. A binary 1 is encoded if the present input bit and past encoded bit are opposite and a binary 0, is encoded if the states are the same. This is equivalent to the truth table of XOR gate.

One limitation of Polar Signalling is that the signal for a 1 is exactly -ve of signal for a 0. One many transmissions, it may be impossible to determine the exact state polarity.



The encoded differential data are generated by

$$e_n = d_n \oplus e_{n-1}$$

decoded by $\hat{d}_n = \hat{e}_n \oplus \hat{e}_{n-1}$

Example of differential encoding

Encoding (d_n)
Input sequence 1 1 0 1 0 0 1
encoded sequence e_n 1 0 1 1 0 0 0 1
Reference digit

Decoding (with correct ch: Polarity)
Received sequence $\hat{e}_n$ (correct Polarity) 1 0 1 1 0 0 0 1
Decoded sequence $\hat{d}_n$ 1 1 0 1 0 0 1

Decoding (with inverted ch: Polarity)
Received sequence $\hat{e}_n$ (inverted Polarity) 0 1 0 0 1 1 1 0
Decoded sequence $\hat{d}_n$ 1 1 0 1 0 0 1