Error-Detecting codes

What is Error?

- Error is a condition when the output information does not match with the input information.

- During transmission, digital signals suffer from noise that can introduce errors in the binary bits travelling from one system to other. That means a 0 bit may change to 1 or a 1 bit may change to 0.

- The most common error-detecting code is parity check.

Parity bits

- To detect and correct the errors, additional bits are added to the data bits are called parity bits.

- There is two types of parity bits in error detection, they are

    1. Even parity
        - If the data has even number of 1's, the parity bit is 0. Ex: data is 10000001 -> parity bit 0
        - Odd number of 1's, the parity bit is 1. Ex: data is 10010001 -> parity bit 1

2. Odd parity
   - If the data has odd number of 1's, the parity bit is 0. Ex: data is 10011101 -> parity bit 0
   - Even number of 1's, the parity bit is 1. Ex: data is 10010101 -> parity bit 1

Parity generator

The circuit which adds a parity bit to the data at transmitter is called "Parity generator". The parity bits are transmitted and they are checked at the receiver.

Parity checker

If the parity bits sent at the transmitter and the parity bits received at receiver are not equal then an error is detected. The circuit which checks the parity at receiver is called "Parity checker".

3 bit data			Message with even parity		Message with odd parity	
A	B	C	Message	Parity	Message	Parity
0	0	0	000	0	000	1
0	0	1	001	1	001	0
0	1	0	010	1	010	0
0	1	1	011	0	011	1
1	0	0	100	1	100	0
1	0	1	101	0	101	1
1	1	0	110	0	110	1
1	1	1	111	1	111	0

The parity bit is computed as the exclusive-OR (even parity) or exclusive-NOR (odd parity) of all of the other bits in the word.