

Experiment - 8

Q1) What is Hamming Code? Explain with help of an example.
 Hamming code is a set of error correction codes that can be used to detect & correct the errors that can occur when data is moved or stored from the sender to receiver.

Example:

Data to be sent by sender: 11001100

Determining:

$$\begin{array}{c}
 P_1 \\
 P_1 \quad D_3 \quad D_5 \quad D_7 \\
 1 \quad 0 \quad 0 \quad 1 \\
 P_1 = 0
 \end{array}$$

$$\begin{array}{c}
 P_2 \\
 P_2 \quad D_3 \quad D_6 \quad D_7 \\
 0 \quad 0 \quad 1 \quad 1 \\
 P_2 = 0
 \end{array}$$

$$\begin{array}{c}
 P_4 \\
 P_4 \quad D_5 \quad D_6 \quad D_7 \\
 0 \quad 0 \quad 1 \quad 1 \\
 P_4 = 0
 \end{array}$$

$$\begin{array}{c}
 P_8 \\
 P_8 \quad D_9 \quad D_{10} \quad D_{11} \\
 1 \quad 0 \quad 0 \quad 1 \\
 P_8 = 0
 \end{array}$$

Hamming Code: 110001100000

Q2) A 7 bit Hamming Code is received as 1011011 correct the error in a given data stream by applying the hamming code error correction method.

→ Hamming Code: 1011011

$$\begin{array}{c}
 \text{Check } P_1 \\
 P_1 \quad D_3 \quad D_5 \quad D_7 \\
 1 \quad 0 \quad 1 \quad 1 \\
 P_1 = 1
 \end{array}$$

$$\begin{array}{c}
 \text{Check } P_2 \\
 P_2 \quad D_3 \quad D_6 \quad D_7 \\
 1 \quad 0 \quad 0 \quad 1 \\
 P_2 = 0
 \end{array}$$

$$\begin{array}{c}
 \text{Check } P_4 \\
 P_4 \quad D_5 \quad D_6 \quad D_7 \\
 1 \quad 1 \quad 0 \quad 1 \\
 P_4 = 1
 \end{array}$$

$$\begin{array}{c}
 \text{To locate bit: } P_4 \quad P_2 \quad P_1 \\
 1 \quad 0 \quad 1 \rightarrow 5
 \end{array}$$

To correct we have to invert 5th bit

Correct Code: 1001011

3) Given the eight bit data 10111001, generate the 12 bit composite word for hamming code that detects corrects single bit error using even parity.

→ 10111001
 $P_{12} \ P_{11} \ P_{10} \ D_9 \ P_8 \ P_7 \ D_6 \ D_5 \ P_4 \ P_3 \ P_2 \ P_1$
 1 0 1 1 1 0 0 1

Calculate Parity bits:

P_1
 $P_1 \ D_3 \ D_5 \ D_7 \ D_9 \ D_{11}$
 $P_1 \ 1 \ 0 \ 0 \ 0 \ 1$
 $P_1 = 0$

P_2
 $P_2 \ D_3 \ D_6 \ D_7 \ D_{10} \ D_{11}$
 $P_2 \ 1 \ 0 \ 0 \ 1 \ 1$
 $P_2 = 1$

P_4
 $P_4 \ D_5 \ D_6 \ D_7 \ D_{12}$
 $P_4 \ 0 \ 0 \ 0 \ 1$
 $P_4 = 0$

P_8
 $P_8 \ D_9 \ D_{10} \ D_{11} \ D_{12}$
 $P_8 \ 1 \ 1 \ 0 \ 1$
 $P_8 = 1$

Hamming Code:

1011100110

To find error:

$P_8 \ P_4 \ P_2 \ P_1$
 1 0 1 0

We need to invert 10^{th} digit

10011100110

8/11/23