Assignment No. : A3- Hamming Code

Title: Lab Assignment on Unit II: (Use C/C++)

Write a program for error detection and correction for 7/8 bits ASCII codes using Hamming Codes or CRC.

Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode

Code :

Sender Side:

```
#include<stdio.h>

void main()
{ int data[10],i;
   printf("Enter 4 bits of data one by one\n");
   scanf("%d",&data[0]);
   scanf("%d",&data[1]);
   scanf("%d",&data[2]);
   scanf("%d",&data[4]);

   //Calculation of redundancy bits
   data[6]=data[0]^data[2]^data[4];
   data[5]=data[0]^data[1]^data[4];
   data[3]=data[0]^data[1]^data[2];

   printf("\nEncoded data is\n");
   for(i=0;i<7;i++)
      printf("%d",data[i]);
}
```

Receiver side :

```
#include<stdio.h>
void main()
{ int dataatrec[10],c,c1,c2,c3,i;

   printf("\n\tEnter received data bits one by one : \n");
   for(i=0;i<7;i++) scanf("%d",&dataatrec[i]);
```

```
    c1=dataatrec[6]^dataatrec[4]^dataatrec[2]^dataatrec[0];
    c2=dataatrec[5]^dataatrec[4]^dataatrec[1]^dataatrec[0];
    c3=dataatrec[3]^dataatrec[2]^dataatrec[1]^dataatrec[0];
    c=c3*4+c2*2+c1 ;//calculating decimal value

    if(c==0) printf("\n\tNo error while transmission of
       data\n");
    else
     { printf("\n\tError on position: %d",c);

       printf("\nData received : ");
       for(i=0;i<7;i++)
       printf("%d",dataatrec[i]);
       printf("\n\tCorrect message is: ");

       //if errorneous bit is 0 we complement it else vice versa
       if(dataatrec[7-c]==0) dataatrec[7-c]=1;
       else dataatrec[7-
          c]=0;

       for (i=0;i<7;i++)
          printf("%d",dataatrec[i]);
    }
}
```

OUTPUT - 1

```
A:\Computer\SEMESTER 5\Computer
Networks\Assignments\CNL!\A3-Hamming_Code>gcc Hsend.c


A:\Computer\SEMESTER 5\Computer
Networks\Assignments\CNL!\A3-Hamming_Code>a
Enter 4 bits of data one by one
1
1
0
1
```

```
Encoded data is

1100110

A:\Computer\SEMESTER 5\Computer
Networks\Assignments\CNL!\A3-Hamming_Code>gcc Hrev.c


A:\Computer\SEMESTER 5\Computer
Networks\Assignments\CNL!\A3-Hamming_Code>a


       Enter received data bits one by one :

1

1

0

0

1

1

0


       No error while transmission of data


A:\Computer\SEMESTER 5\Computer
Networks\Assignments\CNL!\A3-Hamming_Code>
```

OUTPUT-2

```
A:\Computer\SEMESTER 5\Computer
Networks\Assignments\CNL!\A3-Hamming_Code>gcc Hsend.c


A:\Computer\SEMESTER 5\Computer
Networks\Assignments\CNL!\A3-Hamming_Code>a

Enter 4 bits of data one by one

0

1

1

0


Encoded data is

0110011
```

```
A:\Computer\SEMESTER 5\Computer
Networks\Assignments\CNL!\A3-Hamming_Code>gcc Hrev.c

A:\Computer\SEMESTER 5\Computer
Networks\Assignments\CNL!\A3-Hamming_Code>a

       Enter received data bits one by one :
1
0
1
1
0
1
0

       Error on position: 4
Data received : 1011010
       Correct message is: 1010010
A:\Computer\SEMESTER 5\Computer
Networks\Assignments\CNL!\A3-Hamming_Code>
```

~~A3~~ Hammingcodes. (3)

Q1 What is parity check?

→ A parity check is the process that ensure accurate data transmission betn node during communication A parity bit is appended to original data bit to create an even or odd bit number.
eg if original data is 1010001 there are there 3 is when even parity checking is used parity bit value 1 added to data left side to make no 1's even transmitted data become 11010001. However if odd parity check is used then parity bit value is zero; 01010001

Q2 What is hamming code?

→ hamming code is a set of error correction code that can be used to detect & correct the error that can occur when data is moved or stored from sender to receiver.

Q3 How many redundency bit are required for 16 bits of data?

- The number of redundant bits can be calculated using the following formula.

$2^r \geq m + r + 1$

where r = redundant bit
m = data bit.

∴ for 16 bits of data
i.e $m = 16$
$r = 5$
$2^5 \geq 16 + 5 + 1$
$32 \geq 22$

32 is greater than 22 it satisfies the eq^n

∴ $r = 5$

∴ 5 redundant bits are required for 16 bits of data.

Q4 list advantage of hamming code?

→ (i) They are effectively used to defect and correct errors.

(ii) Single-bit ~~effectively used to defect and correct~~ error correction with the code is effective on data stream network.

(iii) They are extensively used in tele communication.

(iv) It is used in computer memory nodes & embedded processors.

Q5> What is CRC?

→ Cyclic Redundancy check is an error detection code commonly used in digital networks and storage device to defect accident changes to raw data. Blocks of data entering these system get short check value detach based on remainder of polynomial division of their contents.

- CRC is more popular because its is easy to implement.

Name : Pushkaraj Chavan

Class : TE

Div : C

Roll No. : 58