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Computer Networks

Experiment - 3

Aim:-

To implement Cyclic Redundancy Code (CRC) for error detection.

Theory:-

Cyclic Redundancy Check (CRC):-

It is the most powerful method for Error detection and correction.

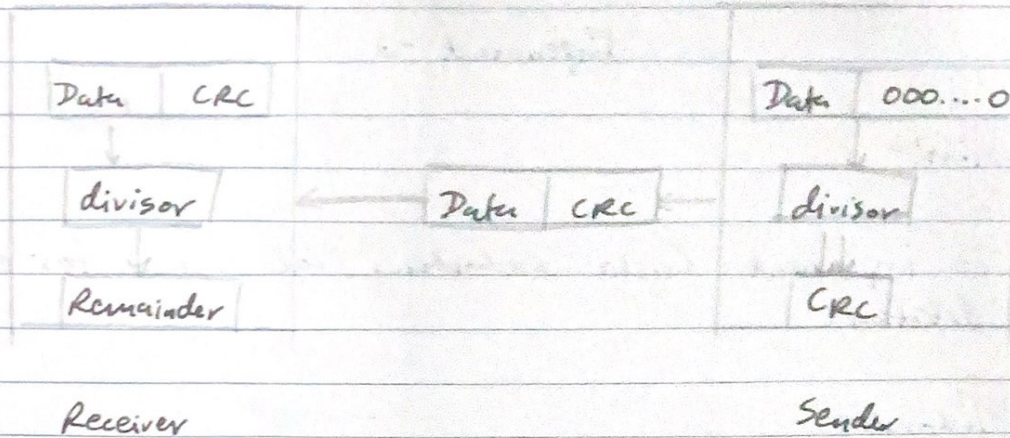
The redundancy bits used by CRC are changed by splitting the data unit by a fixed divisor.

The remainder thus is the CRC.

Qualities:-

- It should have accurately one less bit than the divisor.
- Joining it to the end of the data unit should create the resulting bit sequence precisely divisible by the divisor.

CRC Generator & Checker:-



Process:-

- A string of n 0s is added to the data unit. The number n is one smaller than the number of bits in the fixed divisor.
- The new data unit is divided by a divisor utilizing a procedure known as binary division. The remainder appearing from the division is CRC.
- The CRC of n bits interpreted in phase 2 restores the added 0s at end of the data unit.

Example:- $D \rightarrow 1010001101$ (10 bits)

$P \rightarrow 110101$ (6 bits)

FCS R = to be calculated 5 bits

Hence, $n = 15$, $k = 10$ and $(n - k) = 5$

Message generated $\rightarrow 2^5$ accommodating 1010001101000

$$\begin{array}{r}
 \underline{1101010110} \leftarrow Q \\
 \underline{110101} \mid 101000110100000 \\
 \underline{110101} \\
 111011 \\
 \underline{110101} \\
 111010 \\
 \underline{110101} \\
 111110 \\
 \underline{110101} \\
 101100 \\
 \underline{110101} \\
 110010 \\
 \underline{110101} \\
 01110 \leftarrow R
 \end{array}$$

Remainder 2^5D is inserted to provide $T = 10100011010110$
That is sent

Received frame is then divided by P.

$$\begin{array}{r}
 \underline{1101010110} \\
 \underline{110101} \mid 10100011010110 \\
 - \underline{110101} \\
 111011 \\
 - \underline{110101} \\
 111010 \\
 \underline{110101} \\
 111110 \\
 \underline{110101} \\
 101100 \\
 \underline{110101} \\
 110101 \\
 \underline{110101} \\
 0 \leftarrow R
 \end{array}$$

Hence, no error found.

Conclusion:-

CRC is studied and implemented successfully.

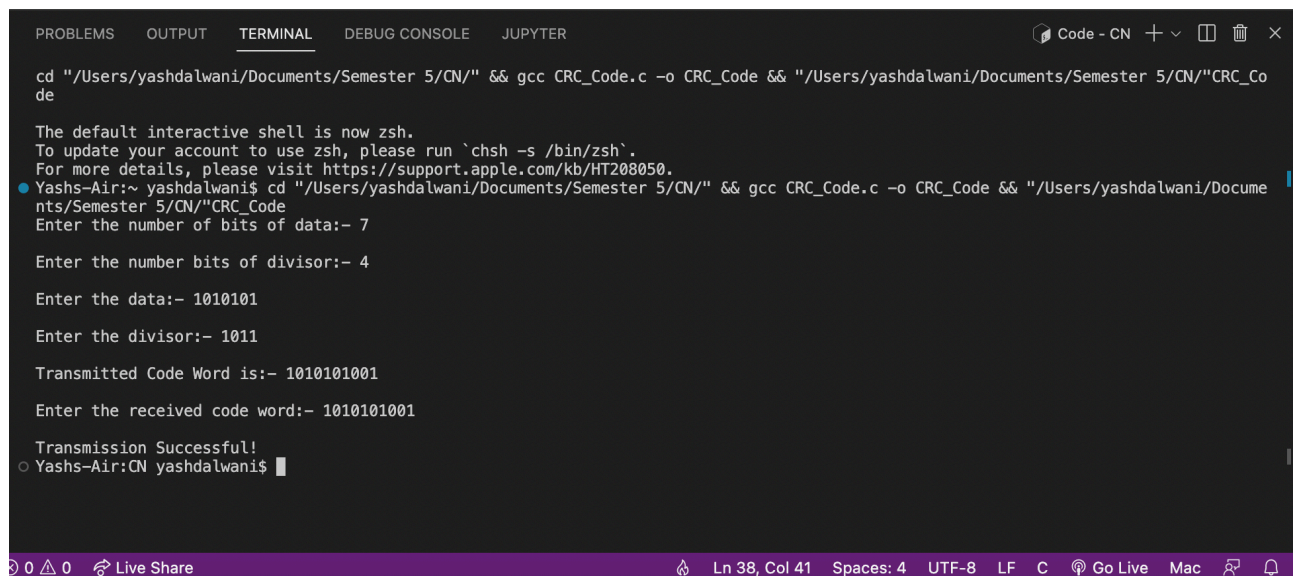
Program:-

```
#include<stdio.h>
char data[20],div[20],temp[4],total[100];
int i,j,datalen,divlen,len,flag=1;
void check();
int main()
{
    printf("Enter the number of bits of data:- ");
    scanf("%d",&datalen);
    printf("\nEnter the number bits of divisor:- ");
    scanf("%d",&divlen);
    len=datalen+divlen-1;
    printf("\nEnter the data:- ");
    scanf("%s",data);
    printf("\nEnter the divisor:- ");
    scanf("%s",div);

    for(i=0;i<datalen;i++)
    {
        total[i]=data[i];
        temp[i]=data[i];
    }
    for(i=datalen;i<len;i++)
        total[i]='0';
    check();
    for(i=0;i<divlen;i++)
        temp[i+datalen]=data[i];
    printf("\nTransmitted Code Word is:- %s",temp);
    printf("\n\nEnter the received code word:- ");
    scanf("%s",total);
    check();
    for(i=0;i<divlen-1;i++)
        if(data[i]!='1')
        {
            flag=0;
            break;
        }
    if(flag==1)
        printf("\nTransmission Successful!\n");
    else
        printf("\nReceived code word contains some error.\n");
}
void check()
{
```

```
for(j=0;j<divlen;j++)
    data[j]=total[j];
while(j<=len)
{
    if(data[0]=='1')
        for(i = 1;i <divlen ; i++)
            data[i] = (( data[i] == div[i])?'0':'1');
    for(i=0;i<divlen-1;i++)
        data[i]=data[i+1];
    data[i]=total[j++];
}
}
```

Output:-



```
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE JUPYTER Code - CN + - [ ] [X]

cd "/Users/yashdalwani/Documents/Semester 5/CN/" && gcc CRC_Code.c -o CRC_Code && "/Users/yashdalwani/Documents/Semester 5/CN/"CRC_Co
de

The default interactive shell is now zsh.
To update your account to use zsh, please run `chsh -s /bin/zsh`.
For more details, please visit https://support.apple.com/kb/HT208050.
● Yashs-Air:~ yashdalwani$ cd "/Users/yashdalwani/Documents/Semester 5/CN/" && gcc CRC_Code.c -o CRC_Code && "/Users/yashdalwani/Docume
nts/Semester 5/CN/"CRC_Code
Enter the number of bits of data:- 7

Enter the number bits of divisor:- 4

Enter the data:- 1010101

Enter the divisor:- 1011

Transmitted Code Word is:- 1010101001

Enter the received code word:- 1010101001

Transmission Successful!
○ Yashs-Air:CN yashdalwani$
```