

% Exp4: Simulation study of Linear Block Codes.

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```
clc;
clear all;
%input generated matrix
g=input('enter the generator matrix:');
disp('G=')
disp('the order of the linear block code for given generator matrix is:')
[n,k]=size(transpose(g))
for i=1:2^k
    for j=k:-1:1
        if rem(i-1,2^(-j+k+1))>=2^(-j+k)
            u(i,j)=1;
        else
            u(i,j)=0;
        end
    end
end
u;
disp('the possible codewords are:')
c=rem(u*g,2)
disp('the minimum hamming distance dmin for given block code=')
d_min=min(sum((c(2:2^k,:))'))
%codeword
r=input('enter the received code word:')
p=[g(:,n-k+2:n)];
h=[transpose(p),eye(n-k)];
disp('hamming code')
ht=transpose(h)
disp('syndrome of a given codeword is:')
s=rem(r*ht,2)
for i=1:1:size(ht)
    if (ht(i,1:3)==s)
        r(i)=1-r(i);
        break;
    end
end
disp('the error is in bit:')
i
disp('the corrected codeword is:')
r
```

Command window

enter the generator matrix:[1 0 0 0 1 0 1;0 1 0 0 1 1 1;0 0 1 0 1 1 0;0 0 0 1 0 1 1]

G=

the order of the linear block code for given generator matrix is:

n = 7

k = 4

the possible codewords are:

c =

```
0 0 0 0 0 0 0
0 0 0 1 0 1 1
0 0 1 0 1 1 0
0 0 1 1 1 0 1
0 1 0 0 1 1 1
0 1 0 1 1 0 0
0 1 1 0 0 0 1
0 1 1 1 0 1 0
1 0 0 0 1 0 1
1 0 0 1 1 1 0
1 0 1 0 0 1 1
1 0 1 1 0 0 0
1 1 0 0 0 1 0
1 1 0 1 0 0 1
1 1 1 0 1 0 0
1 1 1 1 1 1 1
```

the minimum hamming distance dmin for given block code=

d_min = 3

enter the received code word:[1 0 0 0 1 0 0]

r =

```
1 0 0 0 1 0 0
```

hamming code

ht =

```
1 0 1
1 1 1
1 1 0
0 1 1
1 0 0
0 1 0
0 0 1
```

syndrome of a given codeword is:

s =

```
0 0 1
```

the error is in bit:

i = 7

the corrected codeword is:

$r =$

1 0 0 0 1 0 1

Conclusion:

IN this Experiment we learn about linear block coding with the help of simulation on octave software. A linear block code is a block code in which the exclusive-or of any two codewords results in another codeword. A cyclic code is a linear block code in which the rotation of any codeword results in another codeword.