clc;

clear all;

N=8;

begin=0;

picture=[0 1 0 1 0 0 1 1 0 1 1 1 0 0 0 1 0 1 1 0 1 0 0 1 0];

if begin==0

temp=25\*rand;

begin=floor(temp)+1;

if (begin<19)

n=picture(begin:begin+7);

else

n=[picture(begin:25),picture(1:begin-18)];

end

else

begin=begin+1;

if begin==26

begin=1;

end

if (begin<19)

n=picture(begin:begin+7);

else

n=[picture(begin:25),picture(1:begin-18)];

end

end

PN=n;

%PN=[0 1 2 3 0 1 2 3];

b=PN;

z=zeros(N,101);

%信息码元

figure,subplot(2,1,1)

for i=1:8,

if(b(i)==0)

m=zeros(1,101);

t=i-1:0.01:i;

plot(t,m)

hold on;

else

m=b(i)\*ones(1,101);

t=i-1:0.01:i;

plot(t,m)

hold on;

end;

end;

xlabel('信息码元');

axis([0 8 -2 2]);

grid on;

hold off;

%----------------------------------------------------

%FSK调制

b=PN;

subplot(2,1,2)

for i=1:8,

if(b(i)==0)

m=zeros(1,101);

t=i-1:0.01:i;

y=sin(t.\*(2)\*pi);

plot(t,y);

hold on;

else

m=b(i)\*ones(1,101);

t=i-1:0.01:i;

y=sin(t.\*(2+4\*m)\*pi);

plot(t,y);

hold on;

end;

%y=sin(t.\*(2+2\*m)\*pi);

z(i,:)=y;

% plot(t,y);

end;

xlabel('FSK调制');

axis([0 8 -2 2]);

grid on;

hold off;

y1=z;

yfsk=[];

for i=1:8

yfsk=[yfsk,y1(i,1:100)];

end

figure,

yfsk=[yfsk,0];

lnx=length(yfsk);

nfft=lnx+1;

f = lnx\*(0:nfft/2)/nfft;

%freq=-pi:2\*pi/(lnx-1):pi;% the frequency vector频率向量，长度为num

X=fft(yfsk,nfft);

%plot(freq/pi, abs(X));ylabel('|X|');axis([0 pi/pi min(abs(X)) max(abs(X))]);

plot(f,abs(X(1:nfft/2+1)));

title('FSK信号频谱图');

N=8;

picture=[0 1 2 3 0 1 2 3 0 1 2 3 0 1 2 3 0 1 2 3 0 1 2 3 0]; %跳频图案

if begin==0 %判断是否是跳频开始时刻

temp=25\*rand;

begin=floor(temp)+1;

if (begin<19)

n=picture(begin:begin+7);

else

n=[picture(begin:25),picture(1:begin-18)];

end

else %按跳频图案顺序跳变

begin=begin+1;

if begin==26

begin=1;

end

if (begin<19)

n=picture(begin:begin+7);

else

n=[picture(begin:25),picture(1:begin-18)];

end

end

PN=n;

%PN=[0 1 2 3 0 1 2 3];

b=PN;

z=zeros(N,101);

%----------------------------------------------------

%画PN码的数字直观图

%axes(e1);

figure,subplot(2,1,1)

for i=1:8,

if(b(i)==0)

m=zeros(1,101);

t=i-1:0.01:i;

plot(t,m)

hold on;

else

m=b(i)\*ones(1,101);

t=i-1:0.01:i;

plot(t,m)

hold on;

end;

end;

xlabel('跳频码');

axis([0 8 -0.2 6.2]);

grid on;

hold off;

%---------------------------------------------------------

%画频率合成后的图

subplot(2,1,2)

for i=1:N

a=b(i);

%为频率合成部分

if(a==0)

m=zeros(1,101);

elseif(a==1)

m=ones(1,101);

elseif(a==2)

m=2\*ones(1,101);

elseif(a==3)

m=3\*ones(1,101);

end;

t=i-1:0.01:i;

y=sin(t.\*(16+16\*m)\*pi);

z(i,:)=y;

plot(t,y)

xlabel('跳频图案');

axis([-0.2,8.2,-1.2,1.2]);

hold on;

end;

%title('伪码调制');

grid on;

hold off;

t=0:0.01:8;

%------------------------------------------------------------

y2=z;

ytiaopintuan=[];

for i=1:8

ytiaopintuan=[ytiaopintuan,y2(i,1:100)];

end

figure,

ytiaopintuan=[ytiaopintuan,0];

lnx=length(ytiaopintuan);

nfft=lnx+1;

f = lnx\*(0:nfft/2)/nfft;

%freq=-pi:2\*pi/(lnx-1):pi;% the frequency vector频率向量，长度为num

X=fft(ytiaopintuan,nfft);

%plot(freq/pi, abs(X));ylabel('|X|');axis([0 pi/pi min(abs(X)) max(abs(X))]);

plot(f,abs(X(1:nfft/2+1)));

title('ytiaopintuan信号频谱图');

m=y1.\*y2;

y3=[];

y3duibi=[];

for i=1:8

y3=[y3,m(i,1:100)];

end;

y3=[y3,0];

%axes(e);

t=0:0.01:8;

figure,

plot(t,y3);

axis([-0.2,8.2, -1.2,1.2]);

xlabel('频率合成图');

figure,

lnx=length(y3);

nfft=lnx+1;

f = lnx\*(0:nfft/2)/nfft;

%freq=-pi:2\*pi/(lnx-1):pi;% the frequency vector频率向量，长度为num

X=fft(y3,nfft);

%plot(freq/pi, abs(X));ylabel('|X|');axis([0 pi/pi min(abs(X)) max(abs(X))]);

plot(f,abs(X(1:nfft/2+1)));

title('y3信号频谱图');

t=0:0.01:8;

%-----噪声------

%snr=input('输入噪声功率单位dB:');

snr=0.1;%10的5次方，五十DB

sgma=sqrt(1/snr)/2;

for i=1:100\*8+1,

u=rand/2;

z=sgma\*(sqrt(2\*log(1/(1-u))));

u=rand/2;

n=z\*cos(2\*pi\*u);

y(i)=n;

y4(i)=y3(i)+n;

end

t=0:0.01:8;

figure,

plot(t,y);

xlabel('噪声图');

t=0:0.01:8;

figure, %噪声图

plot(t,y4);

%叠加噪声后的信号

xlabel('加躁信号图');

grid on;

%-----------解调部分频率合成-----------

PNs=PN;

N=8;

b=PNs;

z=zeros(N,101);

%----------------------------------------------------

%画PN码的数字直观图

%axes(e1);

figure,subplot(2,1,1)

for i=1:8,

if(b(i)==0)

m=zeros(1,101);

t=i-1:0.01:i;

plot(t,m)

hold on;

else

m=b(i)\*ones(1,101);

t=i-1:0.01:i;

plot(t,m)

hold on;

end;

end;

axis([-0.2 8.2 -0.2 3.2]);

grid on;

hold off;

%---------------------------------------------------------

%画频率合成后的图

subplot(2,1,2)

for i=1:N

a=b(i);

if(a==0)

m=zeros(1,101);

elseif(a==1)

m=ones(1,101);

elseif(a==2)

m=2\*ones(1,101);

elseif(a==3)

m=3\*ones(1,101);

end;

t=i-1:0.01:i;

y=sin(t.\*(16+16\*m)\*pi);

yduibi=sin(t.\*(16)\*pi);

z(i,:)=y;

zduibi(i,:)=yduibi;

plot(t,y)

axis([-0.2,8.2,-1.2,1.2]);

hold on;

end;

grid on;

hold off;

y=z;

y5=y;

y=[];

for i=1:8

y=[y,y5(i,1:100)];

end;

y5=[y,0];

y6=y4.\*y5;

t=0:0.01:8;

figure,subplot(2,1,1)

plot(t,y6);

axis([-0.2,8.2, -1.2,1.2]);

xlabel('跳频解调');

grid on;

%----跳频解调部分----

figure,subplot(2,1,1)

t=0:0.01:8;

plot(t,y6);

subplot(2,1,2)

for i=1:8,

t=i-1:0.01:i;

y=y6(1,100\*(i-1)+1:100\*i+1);

ts=0.001; fs=1/ts; df=0.3;

m=y;

fs=1/ts;

%if nargin==2

% n1=0;

%else

n1=fs/df;

%end

n2=length(m);

n=2^(max(nextpow2(n1),nextpow2(n2)));

M=fft(m,n);

m=[m,zeros(1,n-n2)];

df=fs/n;

Y=M;

Y=Y/fs;

y=m;

df1=df;

f=[0:df1:df1\*(length(y)-1)]-fs/2;

%function dem=DSB\_jietiao(fs,df1,t,Y,f)

f\_cutoff=120; %滤波器截止频率

n\_cutoff=floor(120/df1); %设计滤波器

H=zeros(size(f));

H(1:n\_cutoff)=2\*ones(1,n\_cutoff);

H(length(f)-n\_cutoff+1:length(f))=2\*ones(1,n\_cutoff);

DEM=H.\*Y; %滤波器输出（已调信号）频谱

dem=real(ifft(DEM))\*fs; %滤波器输出（已调信号）

dem=dem(1:length(t));

plot(t,dem)

xlabel('解扩后的FSK信号');

grid on;

hold on;

y7(1,100\*(i-1)+1:100\*i+1)=dem;

end;

ym=y7;

Wn=0.04;

[B,A]=butter(6,Wn,'low');

yS1=filter(B,A,y7);

t=0:0.01:8;

figure,subplot(2,1,1)

plot(t,yS1);

axis([-0.2,8.2,-1.5,1.5]);

xlabel('经带通滤波后信号w1');

grid on;

Wn=0.04;

[B,A]=butter(6,Wn,'high');

yS2=filter(B,A,ym);

t=0:0.01:8;

subplot(2,1,2)

plot(t,yS2);

axis([-0.2,8.2,-1.5,1.5]);

xlabel('经带通滤波后信号w2');

grid on;

figure,subplot(2,1,1)

t=0:0.01:8;

y=sin(2\*pi\*t);

Wn=0.04;

[B,A]=butter(6,Wn,'low');

yS1\_1=filter(B,A,y);

plot(t,yS1\_1);

axis([-0.2,8.2,-1.5,1.5]);

xlabel('本地振荡信号w1');

grid on;

subplot(2,1,2)

rdefsk1=yS1.\*yS1\_1;

plot(t,rdefsk1);

axis([-0.2,8.2,-1.5,1.5]);

xlabel('与w1相乘后的信号');

grid on;

figure,subplot(2,1,1)

t=0:0.01:8;

y=sin(6\*pi\*t);

Wn=0.04;

[B,A]=butter(6,Wn,'high');

yS2\_2=filter(B,A,y);

plot(t,yS2\_2);

axis([-0.2,8.2,-1.5,1.5]);

xlabel('本地振荡信号w2');

grid on;

subplot(2,1,2)

rdefsk2=yS2.\*yS2\_2;

plot(t,rdefsk2);

axis([-0.2,8.2,-1.5,1.5]);

xlabel('与w2相乘后的信号');

grid on;

t=0.4:0.01:8.4;

figure,subplot(2,1,1)

Wn=0.02;

[B,A]=butter(2,Wn,'low');

yS1\_2=1.6\*filter(B,A,rdefsk1);

plot(t,yS1\_2);

axis([0,8.9,-1.5,1.5]);

xlabel('w1低通滤波');

grid on;

Wn=0.025;

subplot(2,1,2)

[B,A]=butter(2,Wn,'low');

yS2\_3=1.6\*filter(B,A,rdefsk2);

plot(t,yS2\_3);

axis([0,8.9,-1.5,1.5]);

xlabel('w2低通滤波');

grid on;

%-----------判决-----------------

figure,subplot(3,1,1)

for i=1:8,

j=80+100\*(i-1);

if(yS1\_2(j)>0.3)

m=-1\*ones(1,101);

t=i-1:0.01:i;

plot(t,m)

hold on;

else

m=zeros(1,101);

t=i-1:0.01:i;

plot(t,m)

hold on;

end;

z(i,:)=m;

end;

xlabel('解调出来的信号1');

axis([0 8 -2 2]);

grid on;

hold off;

y1=z;

yjiet1=[];

for i=1:8

yjiet1=[yjiet1,y1(i,1:100)];

end

yjiet1=[yjiet1,0];

subplot(3,1,2)

for i=1:8,

j=80+100\*(i-1);

if(yS2\_3(j)>0.3)

m=ones(1,101);

t=i-1:0.01:i;

plot(t,m)

hold on;

else

m=zeros(1,101);

t=i-1:0.01:i;

plot(t,m)

hold on;

end;

z(i,:)=m;

end;

xlabel('解调出来的信号2');

axis([0 8 -2 2]);

grid on;

hold off;

y2=z;

yjiet2=[];

for i=1:8

yjiet2=[yjiet2,y2(i,1:100)];

end

yjiet2=[yjiet2,0];

yjietiaohout=yjiet2+yjiet1;

subplot(3,1,3)

for i=1:8,

j=50+100\*(i-1);

if(yjietiaohout(j)>0)

m=ones(1,101);

t=i-1:0.01:i;

plot(t,m)

hold on;

else

m=zeros(1,101);

t=i-1:0.01:i;

plot(t,m)

hold on;

end;

end;

xlabel('解调出来的信号');

axis([0 8 -2 2]);

grid on;

hold off;