n=1:1000;f1=10;f2=20;Fs=1000;Ts=1/Fs;

X=sin(2\*pi\*f1\*n\*Ts)+sin(2\*pi\*f2\*n\*Ts);

N=sqrt(0.6)\*rand(1,1000);

Y=X+N;

rxx=xcorr(Y');

H=zeros(1,11);

rxy=xcorr(X',Y');

R=zeros(11,11);

for i=1:11

for j=1:11

R(i,j)=rxx(1000+abs(i-j));

end

end

H=inv(R)\*rxy(1000:1010,1);

%H1=H(1:11);

%H2=H(1:101);

%Yf1=conv(H1,Y);

%Yf2=conv(H2,Y);

Yf3=conv(H,Y);

%SYf1=abs(fft(Yf1));

%SYf2=abs(fft(Yf2));

SYf3=abs(fft(Yf3));

SX=abs(fft(X));

SY=abs(fft(Y));

figure();

subplot(3,1,1);plot(X);title('input signal');xlabel('n samples');ylabel('X[n]');

subplot(3,1,2);plot(Y);title('corrupted signal');xlabel('n samples');ylabel('Y[n]');

subplot(3,1,3);plot(N);title('channel noise ');xlabel('n samples');ylabel('N[n]');

%figure();

%subplot(3,1,1);plot(Yf1);title('filtered signal with order 11');xlabel('n samples');ylabel('Yf1[n]');

%subplot(3,1,2);plot(Yf2);title('filtered signal with order 101');xlabel('n samples');ylabel('Yf2[n]');

figure();

subplot(4,1,1);plot(Yf3);title('filtered signal with order 11');xlabel('n samples');ylabel('Yf3[n]');

%subplot(5,1,1);plot(SYf1);title('filtered signal with order 11');xlabel('f(Hz)');ylabel('SYf1[f]');

%subplot(5,1,2);plot(SYf2);title('filtered signal with order 101');xlabel('f(Hz)');ylabel('Sf2[f]');

subplot(4,1,2);plot(SYf3);title('filtered signal with order 11');xlabel('f(Hz)');ylabel('SYf3[f]');

subplot(4,1,3);plot(SX);title('input signal');xlabel('f(Hz)');ylabel('X[f]');

subplot(4,1,4);plot(SY);title('corrupted signal');xlabel('f(Hz)');ylabel('SY[f]');