***EE213 Assignment 3: Digital Filtering***

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**Task 1: DTFT of Signal 1**

**Code:**

load('noisysig1.mat');

sound(noisysig1);

x = noisysig1(100:1100);

M = 5000;

[X,w] = DTFT(x,M);

dB = 20\*log10(abs(X));

>>plot(w,dB);

>>xlabel(‘Frequency(rad/sample)’);

>>ylabel(‘Magntitude(dB)’);

**图表, 直方图

描述已自动生成**

**Comments:**

The noise was so loud that it drowned the sound.

**Task 2: Simple FIR Filter Design**

**Code:**

load('noisysig1.mat');

nums = randi(10,1,10);

[max\_val,max\_ind] = max(nums);

[Xmax,ind\_Xmax] = max(X);

wc = (1-ind\_Xmax/(length(w)/2 ))\*(-pi);

h = [1,-2\*cos(w),1];

y = conv(h, noisysig1);

>> plot(w,dB);

>> xlabel('Frequency(rad/sample)');

>> ylabel('Magntitude(dB)');

图表, 直方图

描述已自动生成

图表

描述已自动生成 图表, 直方图

描述已自动生成

**Comments:**

The filter removes the single frequency of the noise signal and makes the original sound clear.

**Task 3: DTFT of Signal 2**

**Code:**

load('noisysig2.mat');

sound(noisysig2);

x = noisysig2(100:1100);

M = 5000;

[X,w] = DTFT(x,M);

dB = 20 \* log10(abs(X));

plot(w,dB);

xlabel('Frequency(rad/sample)');

ylabel('Magntitude(dB)');

**图表, 直方图

描述已自动生成**

**Comments:**

Noise almost mixed with sound, sound signal quality is poor, noise signal does not completely cover the sound signal.

**Task 4: FIR Filter Design using Window Method:**

**Code:**

N = 21;

h = [];

n0= (N-1)/2;

wc=2;

for k= 1:N+1

h(k)= (wc/pi)\*sinc(wc(k-1-n0)/pi);

end

y = conv(h, noisysig2);

x = y(100:1100);

M = 5000;

[X,w] = DTFT(x,M);

dB = 20\*log10(abs(X));

plot(w,dB);

xlabel('Frequency(rad/sample)');

ylabel('Magntitude(dB)');

**for N = 21**

**图形用户界面, 图表

描述已自动生成**

**for N = 101**

**图表

描述已自动生成  
Comment:**

Obviously, when N=21, it's still a little noisy. But increase it to 101 and the sound becomes very clear. By increasing the number of frequency options, the processed sound becomes clearer.

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That’s all

Thank you!