

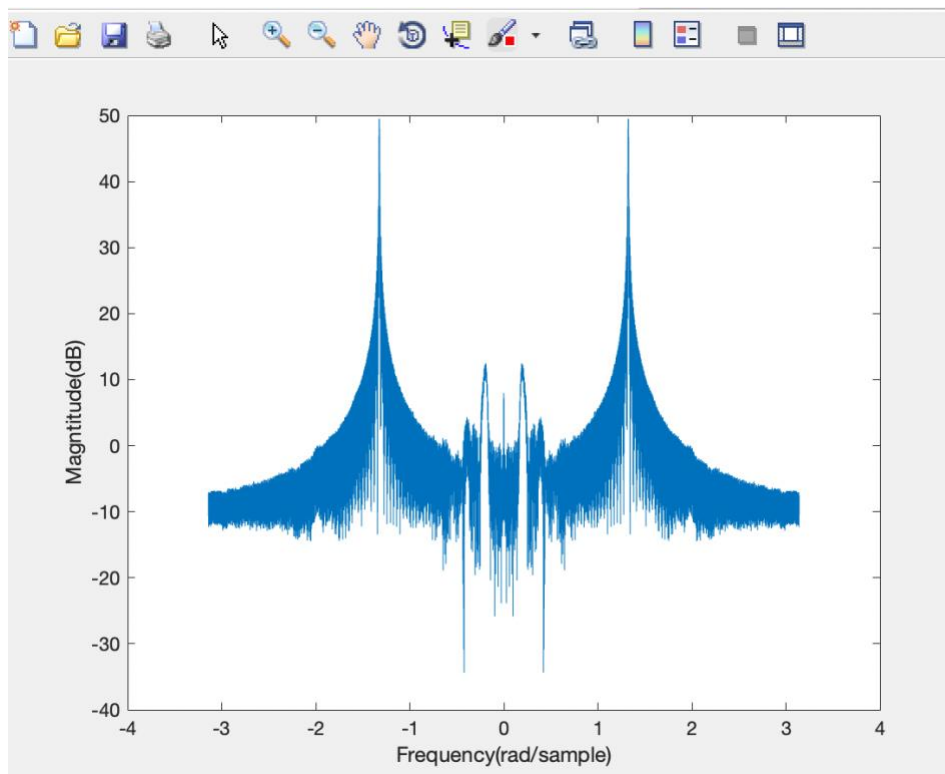
# ***EE213 Assignment 3: Digital Filtering***

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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)');
```



### **Comments:**

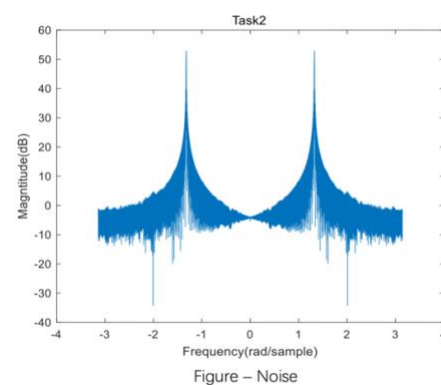
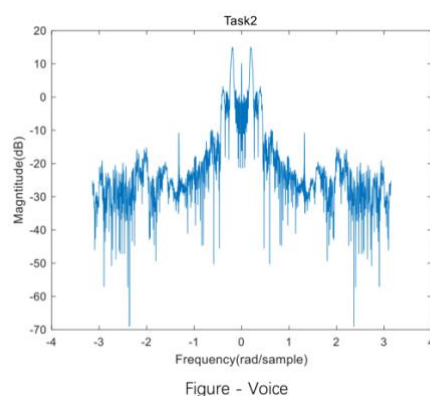
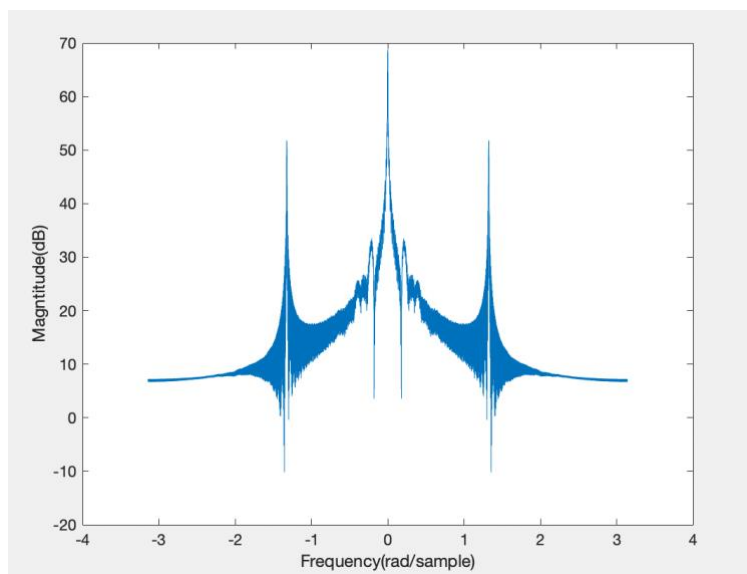
The noise was so loud that it drowned the sound.

## 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)');
```



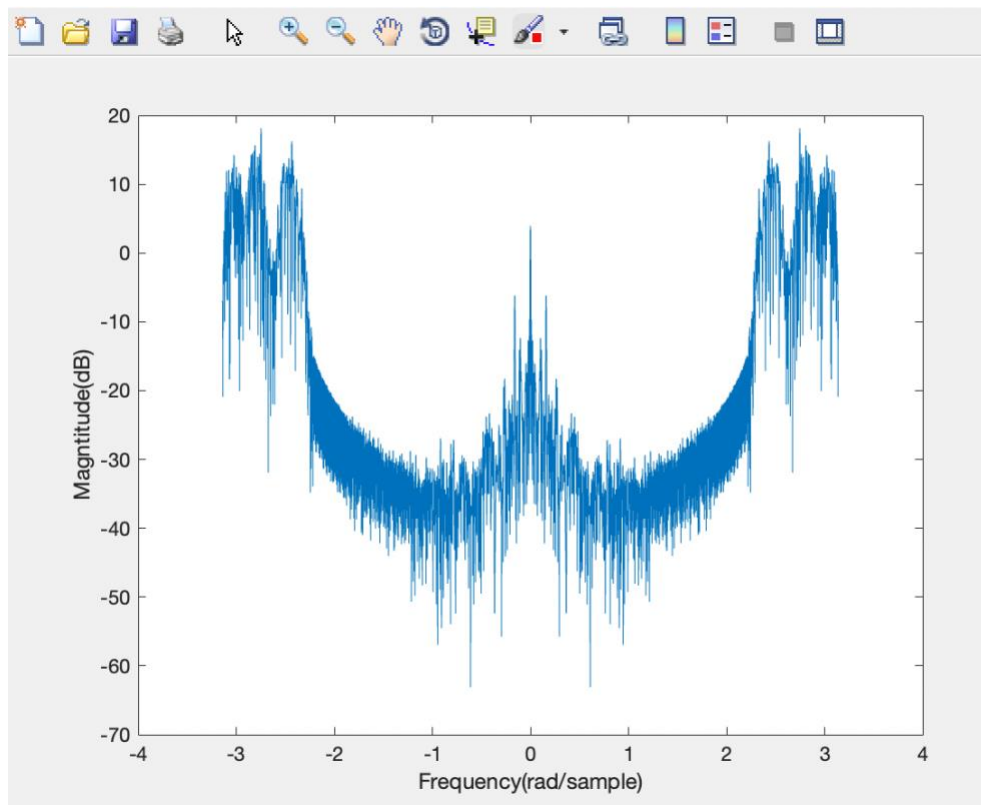
### Comments:

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)');
```



#### Comments:

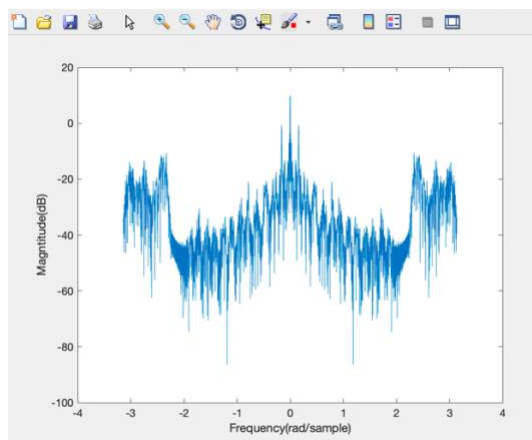
Noise almost mixed with sound, sound signal quality is poor, noise signal does not completely cover the sound signal.

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

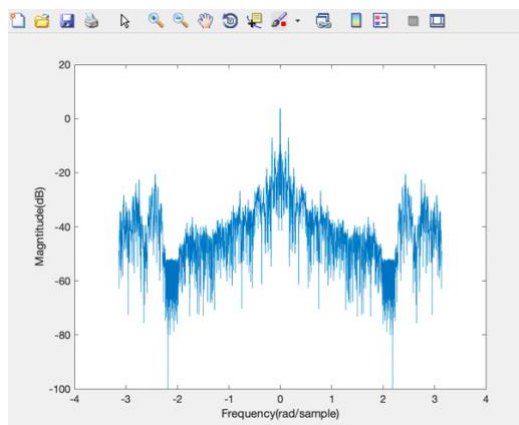
##### **Code:**

```
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**



##### **for N = 101**



**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!