**Lab 5 System, Convolution and Filter**

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| **Introduction**  The Lab5 is an overview about system, convolution and filter. And we learn how to deal with acoustic signal.  1.Designing a filter via Matlab,which is about Butterworth filter design&Different filter type.  2.Using filtering to generate speech shaped noise and extract signal envelop  3.Adjusting the signal intensity: adjusting signal-to-noise ratio (SNR) level &normalizing signal energy.  **Lab results & Analysis**：  Question(3)  **屏幕剪辑**  1.屏幕剪辑  The result is as shown. Before I use the filter, I make full wave recitation of the signal y. As you can see in the figure, for filter with higher cutoff frequency, the waveform will have higher amplitude.  2.  屏幕剪辑  The result is as shown. Before I use the filter, I make full wave recitation of the signal y. As you can see in the figure, for filter with higher order, the waveform will have higher amplitude. And filter with higher order will have better filtering effect. | |
| **Experience**  12011124 冯柏钧  C:\Users\16954\AppData\Local\Packages\Microsoft.Office.Desktop_8wekyb3d8bbwe\AC\INetCache\Content.Word\屏幕截图(50).pngC:\Users\16954\AppData\Local\Packages\Microsoft.Office.Desktop_8wekyb3d8bbwe\AC\INetCache\Content.Word\屏幕截图(53).png | |
| **Score** |  |

**Code**

**Question 3**

**clc;clear;close all;**

**[x,fs] = audioread("C\_01\_01.wav");**

**N = length(x);fs = 16000;**

**noise = 1-2\*rand(1,N);**

**sig = repmat(noise,1,10);**

**[pxx, w] = pwelch(sig,[],[],512,fs);**

**b = fir2(3000,w/8000,sqrt(pxx/max(pxx)));**

**[h,wh] = freqz(b,1,128);**

**ssn = filter(b,1,noise);**

**ssn = ssn';**

**y = x + ssn;**

**y = (y/norm(y))\*norm(x);**

**fc1 = 100;**

**fc2 = 200;**

**fc3 = 300;**

**[b1, a1] = butter(2,fc1/(fs/2));**

**[b2, a2] = butter(2,fc2/(fs/2));**

**[b3, a3] = butter(2,fc3/(fs/2));**

**y\_abs = abs(y);**

**y\_envelop1 = filter(b1,a1,y\_abs);**

**y\_envelop2 = filter(b2,a2,y\_abs);**

**y\_envelop3 = filter(b3,a3,y\_abs);**

**figure(1)**

**subplot(311)**

**plot(y\_envelop1,'r'),xlabel('t'),**

**ylabel('Response')**

**legend('fc1 = 100')**

**subplot(312)**

**plot(y\_envelop2,'g'),xlabel('t'),**

**ylabel('Response')**

**legend('fc1 = 200')**

**subplot(313)**

**plot(y\_envelop3,'b'),xlabel('t'),**

**ylabel('Response')**

**legend( 'fc3 = 300')**

**[b4, a4] = butter(6,fc2/(fs/2));**

**y\_envelop4 = filter(b4,a4,y\_abs);**

**figure(2)**

**plot(y\_envelop2,'r'),hold on,xlabel('t'),**

**ylabel('Response')**

**plot(y\_envelop4,'g')**

**legend('order1 = 2','order2 = 6')**