SPEECH PROCESSING

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**MATLAB Assignment 7.1**

**1) Use the MATLAB command “audiorecorder” to record your own vowel sound. Use the sampling frequency of 8000, the number of bits 16, and the mono input.**

Ans: Matlab Code

disp('Start speaking.')

s=audiorecorder(8000,16,1)

recordblocking(s,5)

disp('End of Recording.')

x=getaudiodata(s)

sound(x,8000)

plot(x)

xlabel('time')

ylabel('Amplitude')

title('stationary vowel sound aa')

figure, Specgram(x)

xlabel('time')

ylabel('Frequency')

title('Spectrogram of a vowel sound aa')

y=x(10001:10500)

plot(y)

auto=xcorr(y,'unbiased')

plot(-499:499, auto)

xlabel('Lag')

ylabel('autocorrelation')

title('autocorrelation')

Stem(auto)

pitch period T0 from the plot.

T0=58/8000

T0 =

0.0073

F0=1/T0

F0 =

137.9310









**2)** Plot the spectrum of the vowel sound using “freqz”. Find the pitch frequency F0 from the plot and compare this with the result from 2, i.e. F0 = 1/ T0.

Ans:

**Matlab Code:**

z=freqz(y)

stem(z)

xlabel('sample')

ylabel('amplitude')

title('frequency spectrum')



3) Find the linear prediction coefficients with the prediction order of 10 using the MATLAB command “lpc.”

Ans: **Matlab Code** :

[a,e]=lpc(y,10)

figure, freqz(l,a)

title('lpc with prediction order of 10')

a =

Columns 1 through 10

1.0000 -1.2081 0.0368 1.2725 -0.3236 -1.1289 0.8202 0.2875 -0.5578 0.1065

Column 11

0.0270

e =

2.5642e-04

Formant Frequencies are at 0.25, 0.32, 0,81 and 1



5. Plot the pole-zero pattern of the synthesis filter using the MATLAB command “zplane.” Compare the locations of the poles to the formants. Explain the relationship between the poles and the formants.

freqz(1,a)

figure, freqz(y)

figure, zplane(1,a)

roots(a)



**6. Repeat steps 3~5 with the prediction order of 12.**

[a,e]=lpc(y,12)

figure, freqz(l,a)

title('lpc with prediction order of 12')

freqz(1,a)

figure, freqz(y)

figure, zplane(1,a)

roots(a)







**7) Repeat steps 3~5 with the prediction order of 14**

[a,e]=lpc(y,14)

figure, freqz(l,a)

title('lpc with prediction order of 14')

freqz(1,a)

figure, freqz(y)

figure, zplane(1,a)

roots(a)







**8. Discuss the effect of increasing the prediction order.**

If we increasing the prediction order then the bit rate will be slow down.

**MATLAB Assignment 7.2 1.**

1. **Record your own mono speech signal with the sampling frequency of 8 kHz. Implement an LPC analysis filter of Fig. 7.6. Choose M = 10 and find a new set of coefficients and the variance of the prediction error for every 30 ms frame. The input is your own speech signal. Plot and listen to the output error signal.**