clc

clear all

Con=0;

delete(instrfind({'Port'},{'COM20'})); %To disconnect Arduino from Serial Port 20

X=0;

fs=16000;

test=0;

duration=2;

fprintf('Press any key to record "Connect" Word of recording\n',duration);

pause;

fprintf('Recording.\n');

r=wavrecord(2\*fs,fs); %To record first word Connect for database

r=r-mean(r);

fprintf('Press any key to record "data" word %g seconds of recording\n',duration);

pause;

fprintf('Recording.\n');

y=wavrecord(2\*fs,fs); %To record second word data for data base

y=y-mean(y);

fprintf('Press any key to record %g seconds of recording for matching\n',duration);

pause;

fprintf('Recording.\n');

voice=wavrecord(2\*fs,fs); %To record word for completing Task

voice=voice-mean(voice);

fprintf('Finished Recording.\n');

nfft=min(1023,length(r));

s=specgram(r,nfft,fs,hanning(511),380); %To find Spectrogram of voice sample 512 is the window size and 512-380=132 is the window overlap

s1=specgram(y,nfft,fs,hanning(511),380);

s2=specgram(voice,nfft,fs,hanning(511),380);

absolute=transpose(abs(s));

absolute1=transpose(abs(s1));

absolute2=transpose(abs(s2));

a=sum(absolute); %To find sum of all frequency Term

a1=sum(absolute1);

a2=sum(absolute2);

a\_norm=(a-min(a))/(max(a)-min(a)); %To normalize the sample for comparing

a1\_norm=(a1-min(a1))/(max(a1)-min(a1));

a2\_norm=(a2-min(a2))/(max(a2)-min(a2));

F=transpose(a\_norm); % To find transpose of matrix

F1=transpose(a1\_norm);

F2=transpose(a2\_norm);

[x,lag]=xcorr(F2,F); %To find cross Correlation of two signal for comparing it with database stored

[mx,indices]=max(x); %To find Maximum Frequency delay at with correlation is maximum

freq=lag(indices);

[x2,lag2]=xcorr(F2,F1);

[mx2,indices2]=max(x2);

freq2=lag(indices2);

figure(1)

subplot(1,3,1)

plot(abs(s)) %To plot Spectogram of Voice sample

xlabel('Frequency')

ylabel('Energy of STFT signal')

title('Spectrogram of 1st word ')

subplot(1,3,2)

plot(abs(s1))

xlabel('Frequency')

ylabel('Energy of STFT signal')

title('Spectogram of 2nd word ')

subplot(1,3,3)

plot(abs(s2))

xlabel('Frequency')

ylabel('Energy of STFT signal')

title('Spectogram of 3rd word ')

figure(2)

subplot(1,3,1)

plot(F)

xlabel('Frequency')

ylabel('Amplitude')

title('Frequency Spectrum ')

subplot(1,3,2)

plot(F1)

xlabel('Frequency')

ylabel('Amplitude')

title('Frequency Spectrum ')

subplot(1,3,3)

plot(F2)

xlabel('Frequency')

ylabel('Amplitude')

title('Frequency Spectrum')

figure(3)

subplot(1,2,1)

plot(x) %To plot cross correlation of word recorded with sample data

title('XCORR of Connect Word')

xlabel('Frequency')

ylabel('Amplitude')

subplot(1,2,2)

plot(x2)

xlabel('Frequency')

ylabel('Amplitude')

title('XCORR of Data Word')

if(abs(abs(freq)-abs(freq2))>=2) %If frequency difference between two correlation is greater than 2

if(abs(freq)>abs(freq2))

X=X+1;

fprintf(' The Second word is spoken');

else

Con=Con+1;

fprintf(' The First word is spoken');

end

else %It is used to compare which Correlation has more symmetric Graph

if(indices<length(x)/2)

q=1:indices-1;

p=indices+length(q):-1:indices+1;

x\_left=x(q); %To find minimum data on left side

x\_right=x(p); %To find minimum data on right side

error=mean((abs(x\_left-x\_right)).^2); %to find the error in cross correlation graph

else

q=1+freq\*2:indices-1;

p=length(x):-1:indices+1;

x\_left=x(q);

x\_right=x(p);

error=mean((abs(x\_left-x\_right)).^2);

end

if(indices2<length(x2)/2)

q2=1:indices2-1;

p2=indices2+length(q2):-1:indices2+1;

x2\_left=x2(q2);

x2\_right=x2(p2);

error2=mean((abs(x2\_left-x2\_right)).^2);

else

q2=1+freq2\*2:indices2-1;

p2=length(x2):-1:indices2+1;

x2\_left=x2(q2);

x2\_right=x2(p2);

error2=mean((abs(x2\_left-x2\_right)).^2);

end

if(error>error2) %if error2 is greater than first error then word spoken third time is second word

X=X+1;

fprintf(' The Second word is spoken');

else

Con=Con+1;

fprintf(' The First word is spoken');

end

if(Con>0)

a=arduino('COM3') %To conncet arduino to Serial Port20 if first word is spoken.

end

if(X>0)

delete(instrfind({'Port'},{'COM3'})); %To disconnect arduino if connected

a=arduino('COM3');

x=1;

i=0;

while(1)

i=i+1;

s(i).f1=a.analogRead(1); %To read data from analog Pin 1

count=arrayfun(@(x) x.f1,s);

s(i).f2=a.analogRead(2); %To read data from analog Pin 2

count1=arrayfun(@(x) x.f2,s);

s(i).f3=a.analogRead(3); %To read data from analog Pin 3

count2=arrayfun(@(x) x.f3,s);

subplot(3,1,1);

title('X AXIS');

plot(count); %To plot data .

subplot(3,1,2);

title('y AXIS');

plot(count1);

subplot(3,1,3);

title('z AXIS');

plot(count2);

drawnow;

end

end

end