Title: Speech recognition using Correlation

Aim:

To recognize the speaker by matching the frequency of the speaker with the previously recorded samples.

Components required:

- Matlab software.
- Microphone.

Introduction:

Each and every person pronounces words in unique accent and at a particular frequency. The words can be recorded and converted into digital data. This word if repeated again can be compared with the previously recorded samples and matched. It can be used as level of security in places where high level of security is required. Speech recognition is used in almost every security project where we need to speak and tell the password to computer and is also used for automation. For example, to turn an AC on or off using voice commands we use Speech Recognition. The system can be programmed to recognize that whether the user saying ON or OFF. In short, speech recognition plays a vital role in voice control projects. In this project we have implemented speech recognition using correlation.

Code:

```
function speechrecognition(filename)
voice=wavread(filename);
x=voice;
x=x';
x=x(1,:);
x=x';
y1=wavread('one.wav');
y1=y1';
y1=y1(1,:);
y1=y1';
z1=xcorr(x,y1);
m1=max(z1);
l1=length(z1);
t1=-((l1-1)/2):1:((l1-1)/2);
t1=t1';
%subplot(3,2,1);
plot(t1,z1);
y2=wavread('two.wav');
y2=y2';
```

```
y2=y2(1,:);
y2=y2';
z2=xcorr(x,y2);
m2=max(z2);
l2=length(z2);
t2=-((l2-1)/2):1:((l2-1)/2);
t2=t2';
%subplot(3,2,2);

figure
plot(t2,z2);
y3=wavread('three.wav');
y3=y3';
y3=y3(1,:);
y3=y3';
z3=xcorr(x,y3);
m3=max(z3);
l3=length(z3);
t3=-((l3-1)/2):1:((l3-1)/2);
t3=t3';
%subplot(3,2,3);
figure
plot(t3,z3);
y4=wavread('four.wav');
y4=y4';
y4=y4(1,:);
y4=y4';
z4=xcorr(x,y4);
m4=max(z4);
l4=length(z4);
t4=-((l4-1)/2):1:((l4-1)/2);
t4=t4';
%subplot(3,2,4);

figure
plot(t4,z4);
y5=wavread('five.wav');
y5=y5';
y5=y5(1,:);
y5=y5';
z5=xcorr(x,y5);
m5=max(z5);
l5=length(z5);
t5=-((l5-1)/2):1:((l5-1)/2);
t5=t5';
%subplot(3,2,5);
```

```
figure
plot(t5,z5);
m6=300;
a=[m1 m2 m3 m4 m5 m6];
m=max(a);
h=wavread('allow.wav');
if m<=m1
    soundsc(wavread('one.wav'),50000)
        soundsc(h,50000)
elseif m<=m2
    soundsc(wavread('two.wav'),50000)
        soundsc(h,50000)
elseif m<=m3
    soundsc(wavread('three.wav'),50000)
        soundsc(h,50000)
elseif m<=m4
    soundsc(wavread('four.wav'),50000)
        soundsc(h,50000)
elseif m<m5
    soundsc(wavread('five.wav'),50000)
        soundsc(h,50000)
else
   soundsc(wavread('denied.wav'),50000)

end
```

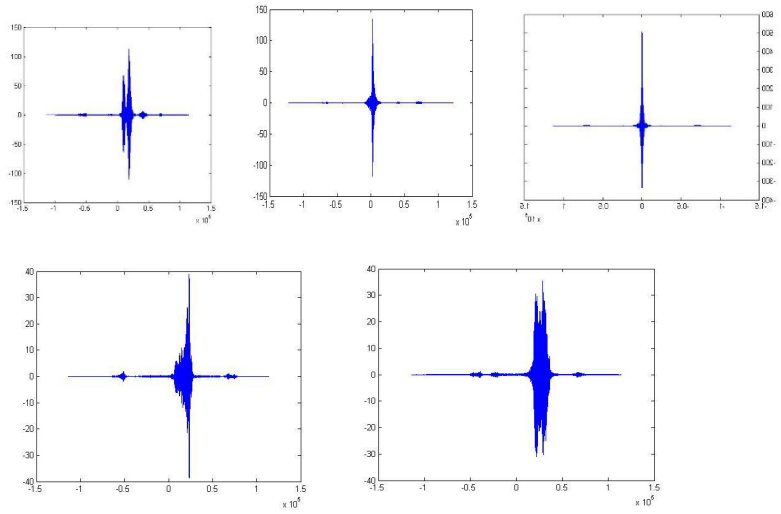
Working principle:

Correlation is normally used in signal processing, where you need to compare two signals and need to find the similarity between them. It is also known as the dot product of those two signals. Correlation is also used for pattern recognition i.e., to find some pattern in the signal we can use Correlation. Here in our project we are using correlation to find similarity between our stored signals and the testing signal.

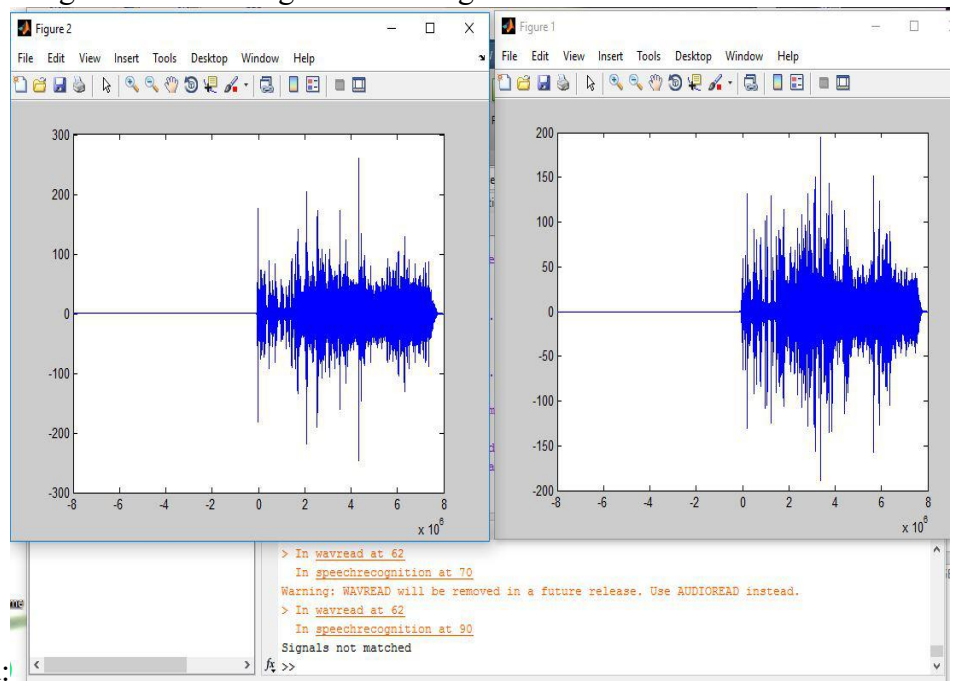
A set of five samples are recorded and fed to the system. The samples are stored. When a new data is given as input, it's correlation with the stored signals is found and if it matches then the result is displayed

`r = xcorr(x,y)` returns the cross-correlation of two discrete-time sequences, `x` and `y`. Cross-correlation measures the similarity between `x` and shifted (lagged) copies of `y` as a function of the lag. If `x` and `y` have different lengths, the function appends zeros at the end of the shorter vector so it has the same length, *N*, as the other.

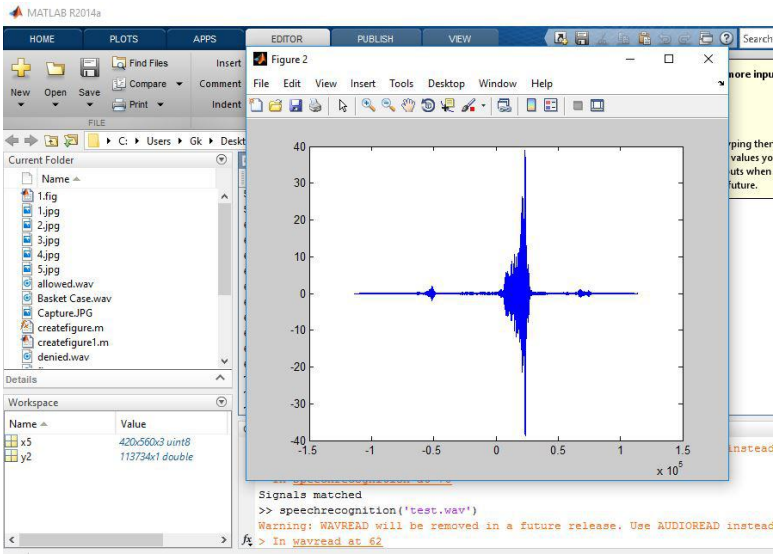
The following are the spectrums of the samples:



The following is the case of signals not being matched:



The following is the case of signals being matched



Conclusion:

This speech recognition system can be used as an added layer of security along with other biometric security systems. Thus provided secure access to confidential information.It can also be used for automation like home automation , voice controlled robots , etc. Can be used in areas which require high level of security. Can be used with other security systems. Can be used in military, Banks etc.