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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SINCE 1993

SIGNALS AND SYSTEM
(212ECE2104)

TITLE: -GENDER DETECTION USING VOICE

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INTRODUCTION

Gender detection has become a significant application in the field of signal and system analysis, and MATLAB provides a powerful platform to explore this area. In this project, we aim to develop a system that can accurately identify the gender of individuals based on audio signals. This task involves analyzing various features extracted from the audio signals, such as pitch, formants, and spectral characteristics, and using signal processing techniques to distinguish between male and female voices. By implementing this project, we can gain valuable insights into the applications of signal and system theory in real-world scenarios, such as voice recognition and authentication systems. MATLAB's extensive signal processing toolbox will play a pivotal role in achieving the project's objectives, and we will explore the code and techniques required to build a robust gender detection system

Speech Recognition: Gender detection is crucial in speech recognition systems, as male and female voices may exhibit different acoustic characteristics. This is valuable in applications like voice assistants, transcriptions, and voice-controlled systems.

In MATLAB we can implement gender detection by analyzing acoustic features like pitch, formants, and prosody in audio signals. Machine learning models can be trained on labeled datasets to classify gender based on these features. The code would involve signal processing techniques and machine learning algorithms to achieve accurate gender detection.

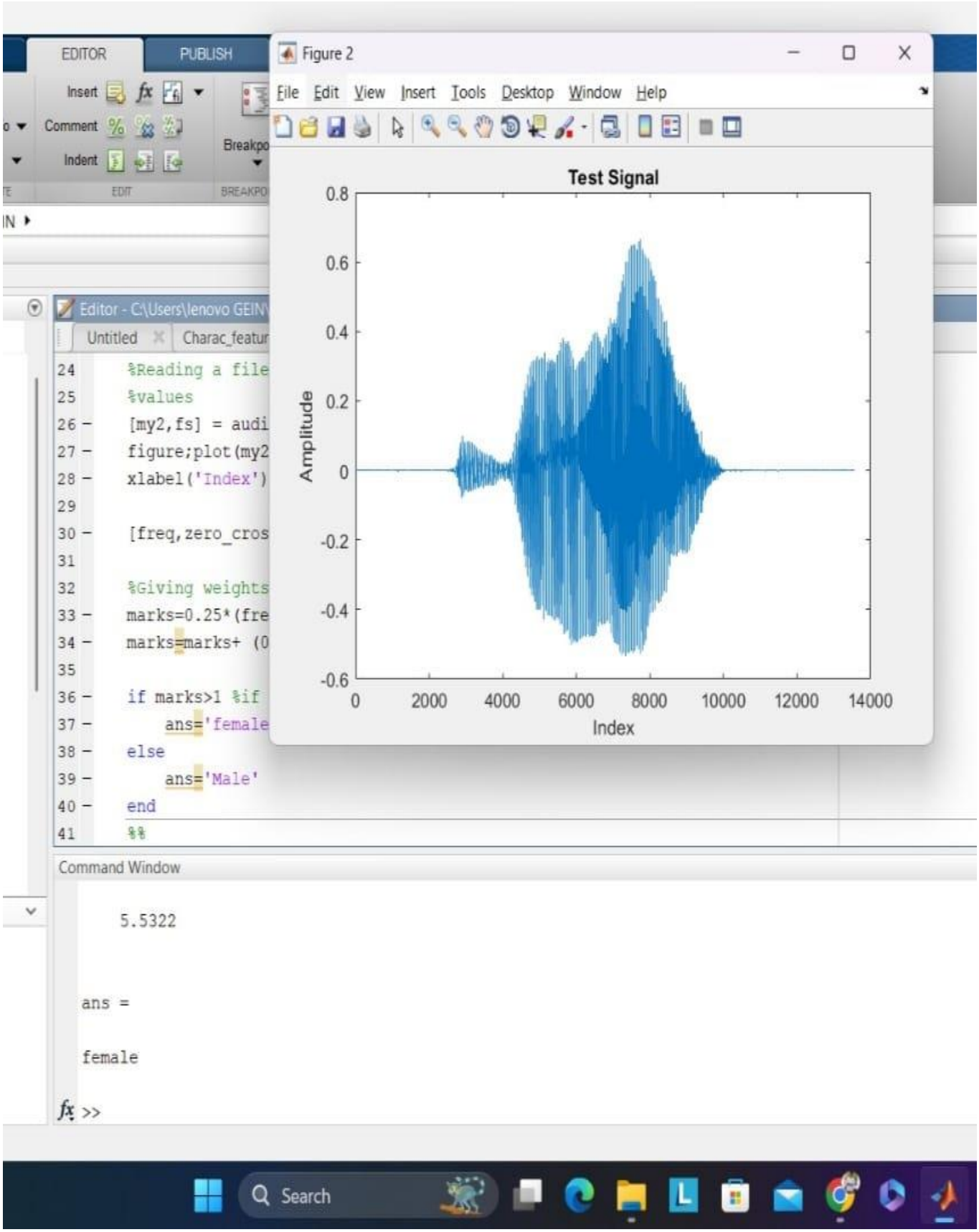
CODE:

```
function [ fundamental, zcr_avg, sum_short_avg] = Charac_features( my2,fs )

%   Detailed explanation goes here
myrecording = my2(:,1);%Taking only one sample of the test
%plot(myrecording);
length_samp=length(myrecording);%Taking the length of the recording

%Filter Low Pass
d=fdesign.lowpass('N,Fc',100,1000,fs);%Designing the low pass fiter with cutoff freq 1000
 %designmethods(d);
 Hd = design(d);
 %fvtool(Hd);
 [h,t] = impz(Hd);%Finding the impulse response of the filter
 myrecording=filter(Hd,myrecording);%Filtering the input

 %Rectangular Windowing
num_of_samples=fs*30*0.001;% 30 milisecond of the frame
num_over=fs*10*0.001;% 10 milisecond of the overlapping
num_samp=num_of_samples-num_over;%Number of new samples in each frame
n=ceil((length_samp-num_of_samples)/num_samp);%Find the number of iterations
%%

for i=1:n % 30 milisecond of the frame and 10 milisecond of the overlapping
   if i==1
      samp(:,1)=myrecording(1:num_of_samples);
   else
      samp(:,i)=myrecording(num_samp*(i-1)+1:num_samp*(i-1)+num_of_samples);
   end

end

short_energy=zeros(1,n);
```

```
zcr_sum=zeros(1,n);
for i=1:n
  auto(:,i)=xcorr(samp(:,i));
  [aut, loc]=findpeaks(auto(:,i));%Finding the peaks
  sum1(i)=mean(diff(loc));%Finding the difference in the location of peaks
  dummy=0;
  short_en=transpose(samp(:,i).*samp(:,i));
  for j=1:num_of_samples
     dummy=dummy+short_en(j);%Adding all the energy in the frame
  end
  short_energy(i)=dummy;

  zcr_dummy=0;
  zcr_sample=samp(:,i);
  for j=2:num_of_samples
     zcr_dummy=zcr_dummy+abs(sign(zcr_sample(j))-sign(zcr_sample(j-
1)));
     %Counting number of zero crossing
  end
  zcr_sum(i)=zcr_dummy;
end
zcr_avg=mean((zcr_sum/2));%Taking the average zero crossing frequency
of all the frames
sum_short_avg=mean(short_energy);%Taking the average short energy of
all the frames
%%
period=max(sum1);%Finding the period of the
fundamental=fs/period;%Finding the fundamental frequency

end

%% Digital Signal Processing Project- Gender Identification and
Classification
% * Kshitij Srivastava, Aayush, Aman Jain

%% Program:
%Feature Matrix
datamat=zeros(11,4); % data matrix to store features
for k=1:11
   filename=['s' num2str(k) '.wav'];
```

```
    [my2,fs] = audioread(filename);%Reading the files

[fundamental_freq,zero_crossing,short_energy]=Charac_features(my2,fs);
%Finding features
    %Storing features in the data matrix
    datamat(k,1)=k;
    datamat(k,2)=fundamental_freq;
    datamat(k,3)=zero_crossing;
    datamat(k,4)=short_energy;
end

%% Feature Extraction and Classification

fundamental_freq_level=135;%Manually fixing the value of the
fundamental freq
zero_crossing_level=12;%Manually fixing the value of the zero crossing
value
short_energy_level=0.5;%Manually fixing the value of the Short energy
value

%Reading a file and getting the fundamental,zero crossing, short energy
%values
[my2,fs] = audioread('s2.wav');
figure;plot(my2);title('Test Signal');
xlabel('Index');ylabel('Amplitude');

[freq,zero_cross,short_ene]=Charac_features(my2,fs);

%Giving weights and finding a number for a particular obseravation
marks=0.25*(freq/fundamental_freq_level)+(zero_cross/zero_crossing_le
vel)*0.35;
marks=marks+ (0.4*short_ene/short_energy_level)

if marks>1 %if value greater than 1 for that particular observation
    ans='female'
else
    ans='Male'
end
```

OUTPUT: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Comment
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Figure 2
File Edit View Insert Tools Desktop Window Help
Test Signal
Amplitude
Index
0.8
0.6
0.4
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-0.4
-0.6
0
2000
4000
6000
8000
10000
12000
14000
Editor - C:\Users\lenovo GEIN\
Untitled
Charac_featur
24 %Reading a file
25 %values
26 [my2,fs] = audi
27 figure;plot(my2
28 xlabel('Index')
29
30 [freq,zero_cros
31
32 %Giving weights
33 marks=0.25*(fre
34 marks=marks+ (0
35
36 if marks>1 %if
37 ans='female
38 else
39 ans='Male'
40 end
41 %%
Command Window
5.5322
ans =
female
>>
Search

INFERENCE:

Data Collection: Gather a dataset of audio signals containing both male and female voices. These signals should be representative of the gender characteristics you want to detect.

Preprocessing: Preprocess the audio signals. This may include resampling, noise reduction, and feature extraction. Common features for gender detection include pitch, formants, and spectral features.

Feature Extraction: Extract relevant features from the preprocessed signals. You can use MATLAB's Signal Processing Toolbox for this, calculating features like pitch using algorithms like autocorrelation or YIN.

Feature Selection: Choose the most relevant features for your classification task. Feature selection methods like PCA (Principal Component Analysis) can be useful.

Training and Testing: Split your dataset into a training set and a testing set with this process, like fitcsvm for SVM-based models.

Manually thereshold is set and basic classifier is made. Finally it successfully classifies any input as being male or female.