DSP Course Project Report

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Abstract

The aim of this project is to identify the voice of a human; if it is a male or a female voice. This will be done using the MATLAB, according to frequencies. We will be reading an audio file from the device, and using a technique to identify the gender of a speaker from their speech analysis. Voice recognition can be used in security, and can be developed to identify the person by their voice.

1. Introduction

By examining multiple aspects of the voice sample, this technique seeks to predict the speaker's gender. Simple short-time auto-correlation results for male and female voice samples are included. MATLAB programming is used to carry out all of this job. Collecting voice samples from a variety of people, both male and female, is a simple way to develop a database

1.1. Procedure

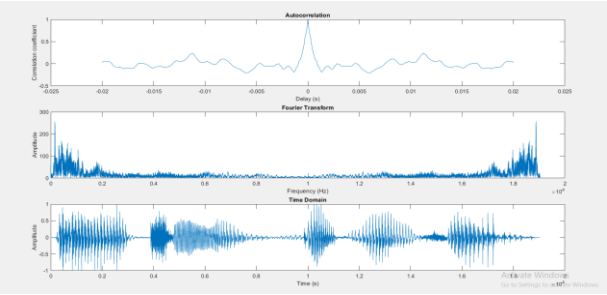
After the audio is read by the program, the program will be processing the audio signal and gets its function and FS value. Then we applied the signal to the coloration function, and took the maximum amplitude to calculate the value of the pitch period. According to the resulting pitch period, the program then determines the gender of the speaker.

- If the pitch period between 85 and 155, then the speaker is male.
- If the pitch period between 165 and 255, then the speaker is a female.
- If the pitch period is greater than 255, then the speaker is a child.
- If the pitch period is less than 85, then the voice cannot be recognized.

1.2. Figures

The figure below shows a sample audio file with its autocorrelation representation and the time and frequency domains representations. The program detected the voice correctly.

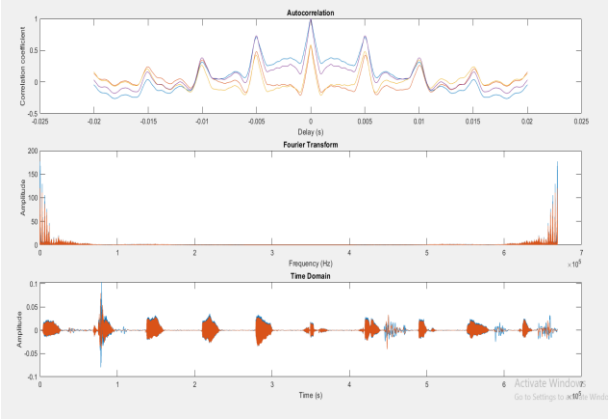
If the pitch period between 85 and 155, then the speaker is male.




```
>> project
Male voice detected
```

Figure 1: Simulation of a male speaker.

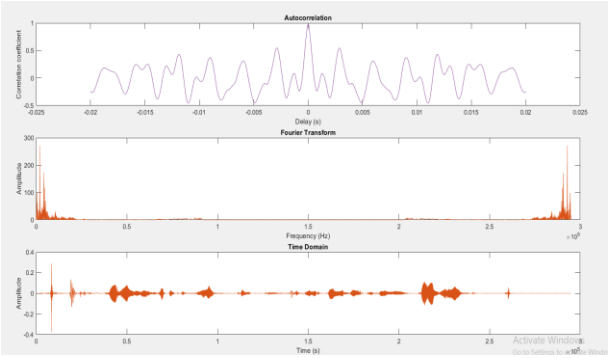
If the pitch period between 165 and 255, then the speaker is female.




```
>> project
Female voice detected
```

Figure 2: Simulation of a female speaker.

If the pitch period is greater than 255, then the speaker is a child.




```
>> project
Child voice detected
```

Figure 3: Simulation of a child speaker.

1.3. Equations

$$\boldsymbol{R(k) = \frac{1}{N}\sum_{n=0}^{N-1} s[n]s[n-k]} \quad \textbf{(1)}$$

Where, R(k) is the autocorrelation function at k. s[n] is the short frame samples with length N samples.

1.4. Audio Files

Multiple audio files were uploaded and read from the device. These files consist of three possible voices; female voices, male voices and children voices. The program listens to these audios and determines the voice based on pitch period.

2. Discussion

For some samples, the program was able to successfully determine the gender, whilst in others, it failed because the pitch value was not in the ranges of male, female, and children voices.

3. Conclusions

In this project, we learnt how to recognize gender by reading an audio file. The autocorrelation function that we had from the audio helped us with determining the pitch value. According to the pitch value, we were able to specify the gender. We learnt how to use MATLAB for processing the signal. Python can also be used for the same procedure. Some signals weren't recognized successfully because they had some noise in the background which affected the analysis of them.

4. References

[1] Ltd, E. P. (2015, December 8). *Gender recognition by voice analysis*. Experts Vision. Retrieved June 16, 2022, from https://xpertsvision.wordpress.com/2015/12/04/gender-recognition-by-voice-analysis/

5. Appendix

```
[file, path] =
uigetfile('*.*');
if ~isequal(file, 0)
    path = fullfile(path,
file);
    [y, fs] = audioread(path);
    sound(y, fs)
    n = length(y);
    x = fs + 50 - mod(fs, 50);
    xx = fs + 500 - mod(fs,
500);
    ms20 = (x / 50);
    ms2 = (xx / 500);
    y_axis = xcorr(y, (ms20),
"coeff");
    x_axis = (-ms20 : ms20) /
fs;
    subplot(3, 1, 1),
plot(x_axis, y_axis);
    title("Autocorrelation");
    xlabel("Delay (s)");
    ylabel("Correlation
coefficient");
    subplot(3, 1, 2),
plot(abs(fft(y)));
    title("Fourier Transform");
    xlabel("Frequency (Hz)");
    ylabel("Amplitude");
    subplot(3, 1, 3), plot(y);
    title("Time Domain");
    xlabel("Time (s)");
    ylabel("Amplitude");
    y_axis = y_axis(ms20 + 1 :
2 * ms20 + 1);
    [rmax, tx] = max(y_axis(ms2
: ms20));
    Fx = fs / (ms2 + tx - 1);
    if(85 <= Fx) && (Fx <= 155)
        disp("Male voice
detected")
    elseif(165 <= Fx) && (Fx <=
255)
        disp("Female voice
detected")
    elseif(Fx > 255)
        disp("Child voice
detected")
    else
        disp("Cant recognize
the speaker's gender")
    end
else
    disp('Nothing selected')
end
```