



**BANSILAL RAMNATH AGARWAL'S CHARITABLE TRUST'S
VISHWAKARMA INSTITUTE OF TECHNOLOGY**
(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

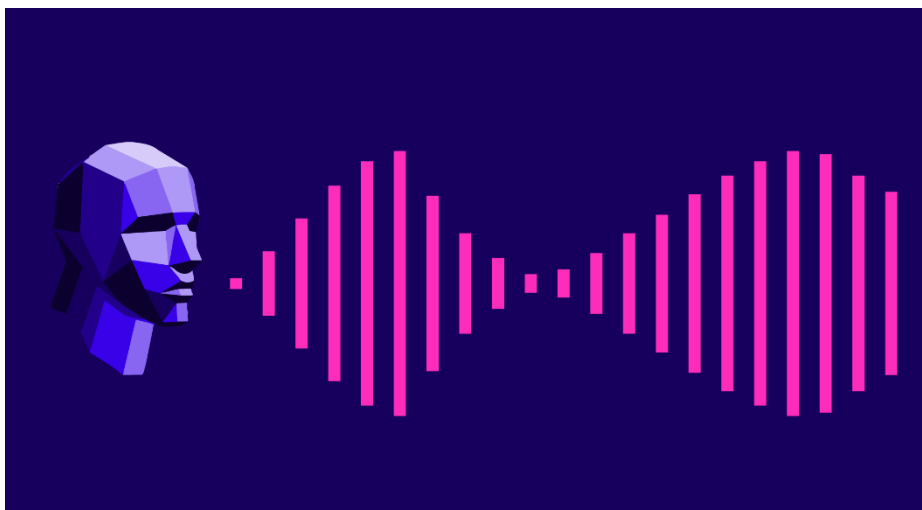
**E & TC Department
A.Y. 2022-23 Semester-I**

SIGNAL PROCESSING

Course Project - Recognition of Gender Using Voice Signals

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1. PROBLEM STATEMENT

Accurately recognizing the gender from voice signals is a challenging task due to differences in voice characteristics and speaking styles. Digital signal processing (DSP) techniques can be used to analyze voice signals and extract features that are relevant for gender recognition.

2. INTRODUCTION

Gender recognition using audio signal in DSP is a technique that involves the analysis of audio signals to classify the gender of a speaker based on various acoustic features, such as pitch, duration, and intensity. The goal of gender recognition using audio signal in DSP is to develop algorithms that can accurately and reliably classify the gender of a speaker, even in noisy or variable recording conditions. Matlab provides powerful tools for digital signal processing, making it an ideal platform for developing gender recognition algorithms. The basic steps involved in gender recognition using audio signal includes audio input/output, feature extraction, and classification. Feature extraction involves analyzing the audio signal to extract relevant features, such as pitch and intensity, that can be used to distinguish between male and female voices. Classification involves using machine learning algorithms to determine the gender of the speaker based on the extracted features.

Gender recognition using audio signal has numerous applications, including speech recognition, security, and forensic investigations. However, it is important to note that gender recognition systems can be prone to errors, particularly when dealing with non-binary or transgender individuals, as these groups may not conform to traditional male or female voice characteristics. Overall, gender recognition using audio signal is a powerful technique that can provide valuable insights into the characteristics of human speech, and has the potential to be useful in a wide range of applications. Accurately recognizing gender from voice signals has numerous applications in several domains, including speech-based user interfaces, speaker verification, and forensic investigations. However, achieving high accuracy in gender recognition is a challenging task due to differences in voice characteristics and speaking styles between individuals.

OBJECTIVES

- To develop a program in Matlab that can recognize the gender of a speaker based on the pitch of their voice, as determined by the autocorrelation method, and provide a rough estimate of the likelihood that the speaker is male or female.
- Additionally, the program should be able to calculate the correlation coefficient and variation between two sound files, and plot their correlation and frequency spectra.

3. PLATFORM USED

Matlab

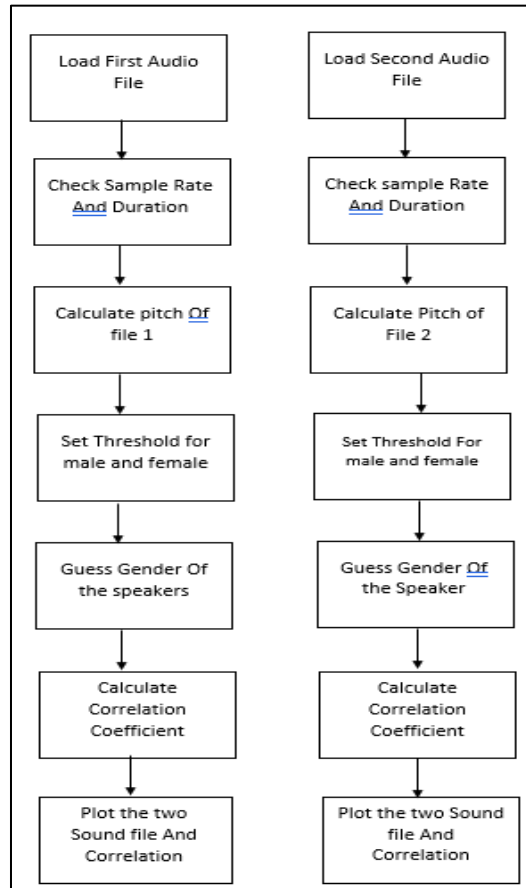
4. METHODOLOGY

In this project, we implemented gender recognition using audio signals in MATLAB with the help of digital signal processing techniques. We first loaded two sound files and checked if they have the same sampling rate and duration. We then calculated the pitch of each sound file by using autocorrelation function and determined if the speaker is male or female based on a predefined threshold pitch value. We also calculated the correlation coefficient and variation between the two sound files and plotted the sound files and their correlation. Moreover, we developed a Graphical User Interface (GUI) to allow users to easily input sound files and obtain the gender recognition results.

The methodology we followed consisted of signal preprocessing, including defining analysis parameters such as frame duration, hop duration, and minimum and maximum pitch values. We then calculated the autocorrelation function and identified the highest peak to determine the pitch value. Next, we made a guess about the gender of the speaker based on the pitch and spectral rolloff values. Finally, we evaluated the similarity between the two sound files by calculating the correlation coefficient and variation and visualized the results using plots. Overall, our implementation of gender recognition using audio signals in MATLAB with a GUI provides

a useful tool for applications such as speech recognition and voice-controlled systems.

5. FLOW CHART



6. ADVANTAGES

- Gender recognition using audio signal can be done using basic signal processing techniques and does not require any advanced machine learning algorithms.
- MATLAB provides a user-friendly environment for implementing DSP algorithms and analyzing audio signals.

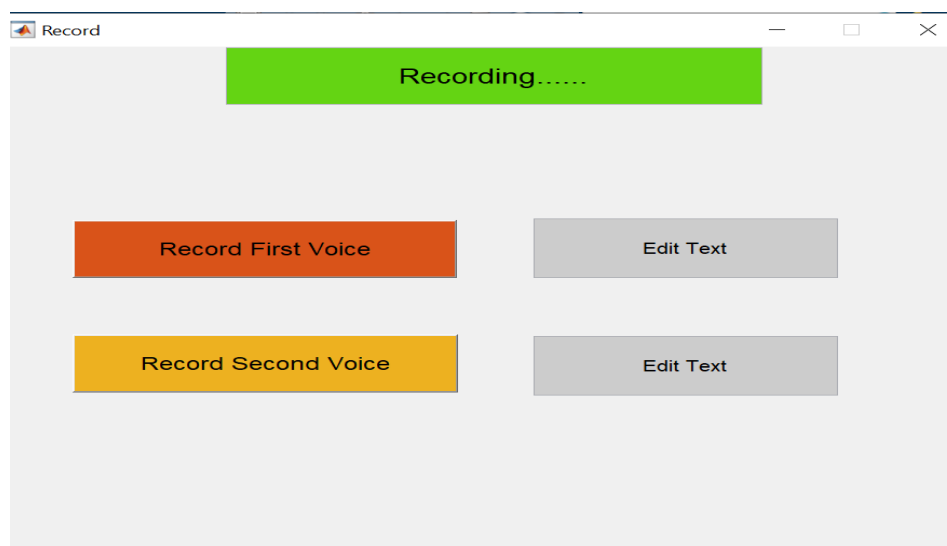
- The use of pitch and spectral rolloff values allows for simple and effective gender recognition.
- The use of a graphical user interface (GUI) makes the process more user-friendly and accessible to non-experts.

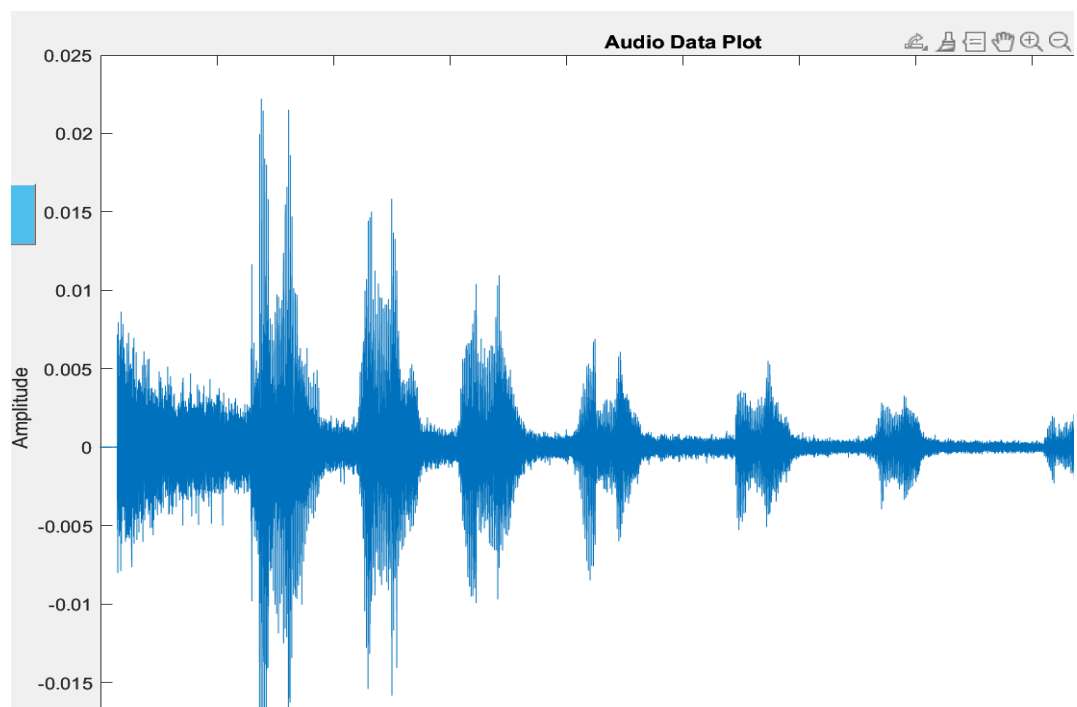
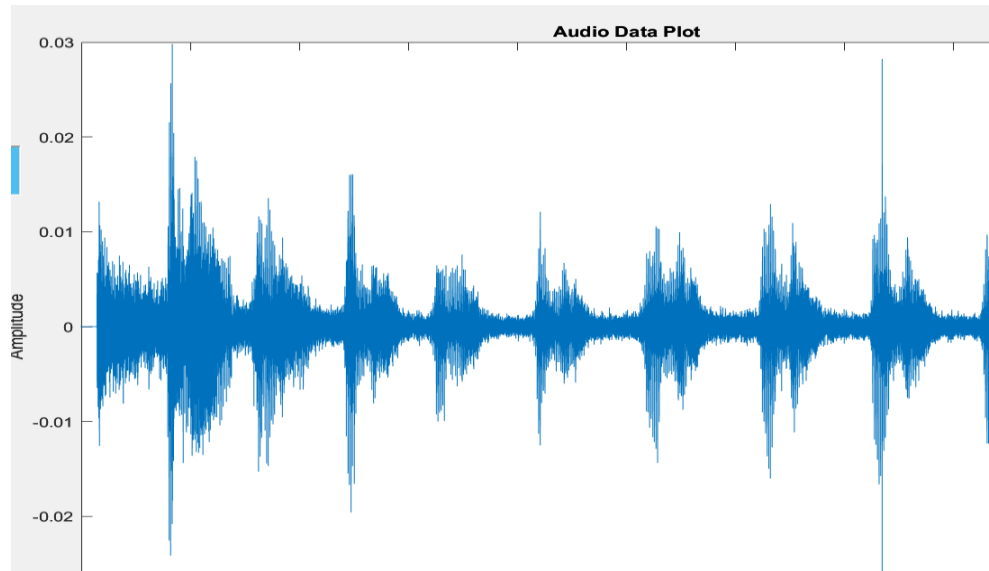
7. Disadvantages:

- The method used in this implementation may not be very accurate or robust, especially in cases where there is a lot of noise or variations in the audio signals.
- The use of a fixed threshold for distinguishing between male and female voices may not be appropriate for all cases, as there may be significant variations in the pitch and spectral characteristics of male and female voices.
- The implementation may not be scalable or suitable for processing large amounts of audio data, as it may be slow and resource-intensive.

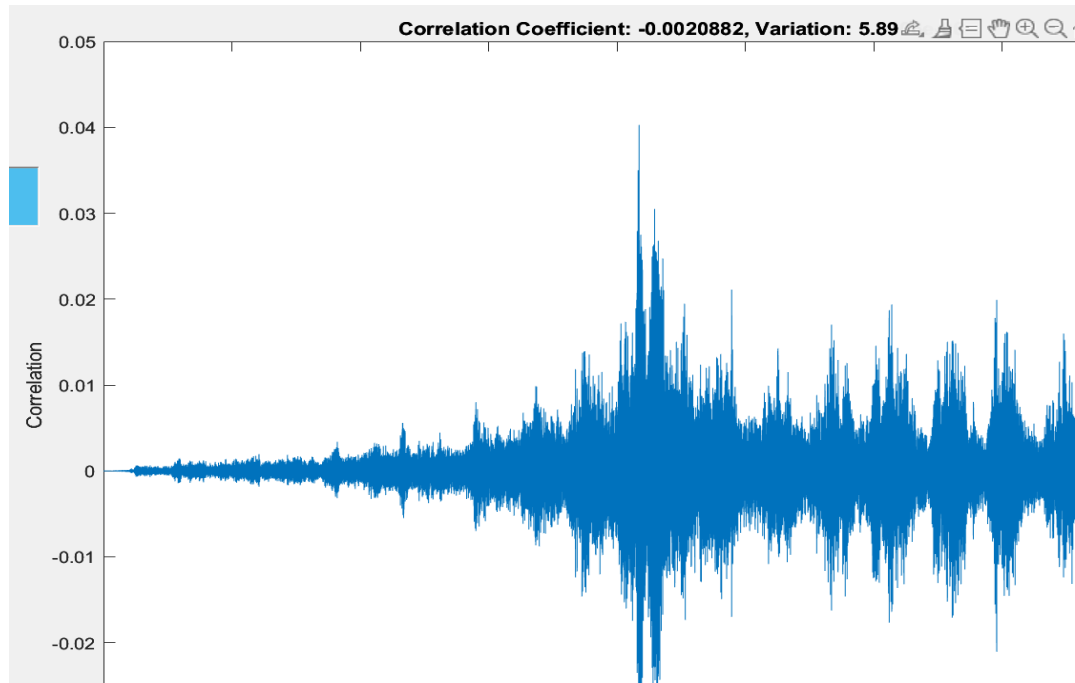
8. Results

1. GUI for Voice Recording:

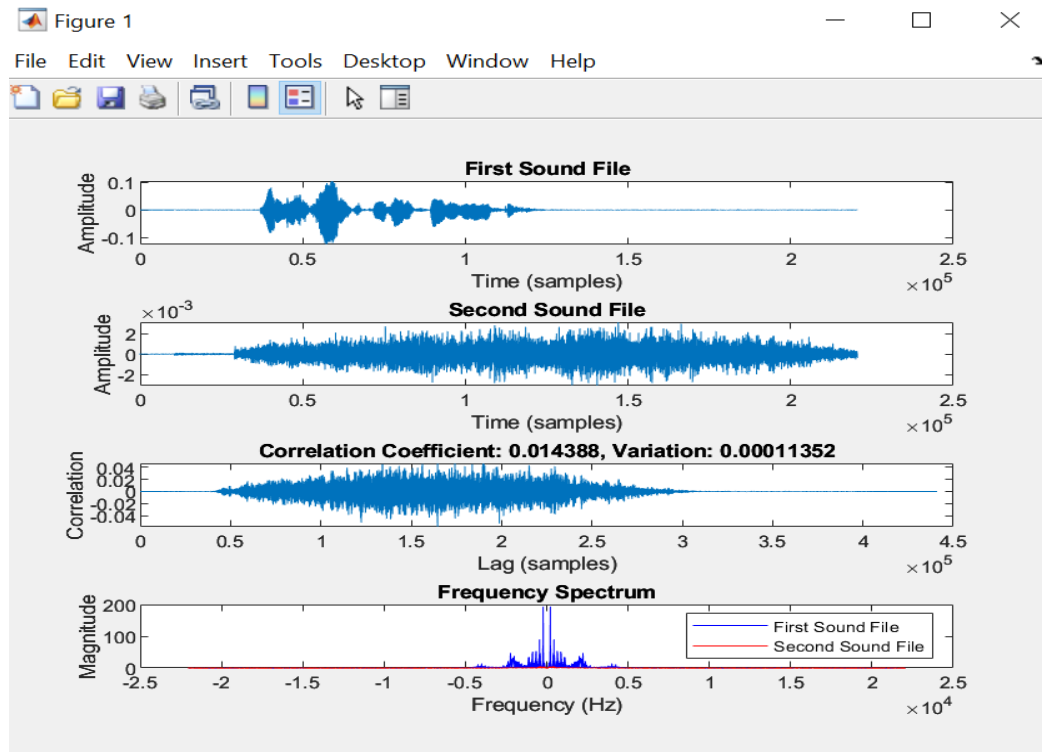




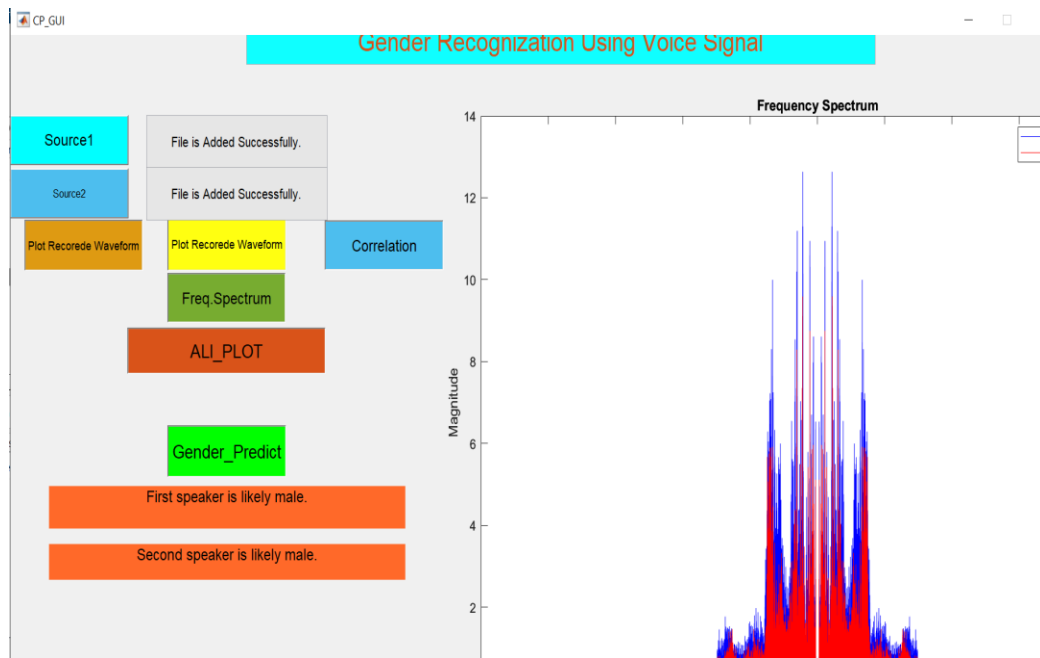
2. Correlation:



3. Correlation and FFT of signals:



4. GUI



Conclusion

In conclusion, gender recognition using audio signal in DSP using MATLAB is a feasible and effective approach. It involves loading two sound files, checking their sampling rate and duration, calculating the pitch using autocorrelation, making a rough guess at the gender based on the pitch, calculating the correlation coefficient and variation between the sound files, and plotting their frequency spectra. By setting a threshold pitch value, the approach is able to distinguish between male and female voices with reasonable accuracy. However, further research and improvements in the method are needed to enhance its accuracy and reliability.