ABSTRACT

Digital audio forensics plays a crucial role in verifying the audio recordings and identifying potential tampering or manipulation. This project focuses on the use of Mel-Frequency Cepstral Coefficients (MFCC) and pitch analysis to enhance the capabilities of digital audio forensic analysis. MFCC, a powerful feature extraction technique, is employed to capture the spectral characteristics of audio, while pitch analysis helps in the identification and verification of speakers and the detection of potential alterations in audio content.The project begins by discussing the significance of audio analysis in digital forensics, highlighting the increasing need for accurate methods to assess the integrity of audio evidence in legal and investigative contexts. It emphasizes the challenges posed by modern audio manipulation tools, making the use of advanced techniques like MFCC and pitch analysis paramount. The integration of MFCC and pitch analysis offers a powerful solution for digital audio forensics, enabling more accurate speaker identification and the detection of audio tampering. This project showcases the potential of these techniques in the field of audio analysis and emphasizes the importance of maintaining the highest standards of accuracy and reliability in digital audio forensic investigations.

keywords : Digital audio forensics, Mel-Frequency Cepstral Coefficient, Audio Analysis.

CONTENTS

INTRODUCTION

In today's digital age, the importance of digital forensics cannot be overstated. With the increasing prevalence of digital devices and the vast amounts of data they generate, there is a growing need for sophisticated tools to investigate, analyze, and uncover evidence from various digital sources. Among these sources, audio data plays a crucial role in numerous. In today's digital age, the importance of digital forensics cannot be overstated. With the increasing prevalence of digital devices and the vast amounts of data they generate, there is a growing need for sophisticated tools to investigate, analyze, and uncover evidence from various digital sources. Among these sources, audio data plays a crucial role in numerous investigations, ranging from criminal cases to corporate fraud.The field of digital audio forensics is continually evolving to keep pace with advancements in technology and the ever-growing volume of audio data available for analysis. In this context, the development of a comprehensive, reliable, and efficient tool for digital audio forensic analysis is of paramount importance. This report focuses on the design and development of such a tool, addressing the challenges and opportunities in the realm of audio forensics.

Audio forensics involves the examination of audio recordings to ascertain their authenticity, origin, and any potential tampering or manipulation. This encompasses a wide range of activities, such as voice identification, speaker recognition, noise reduction, audio enhancement, and the detection of audio forgeries. The ability to perform these tasks accurately and efficiently is critical in legal proceedings, criminal investigations, and cybersecurity efforts. Investigations, ranging from criminal cases to corporate fraud.

Audio feature extraction is a necessary step in audio signal processing, which is a subfield of signal processing. It deals with the processing or manipulation of audio signals. It removes unwanted noise and balances the time-frequency ranges by converting digital and analog signals. It focuses on computational methods for altering the sounds. Audio features are numerical representations of audio signals that can be used to extract meaningful information from the signal. Audio features can be extracted from audio signals in the time domain, the frequency domain, or both. Frequency domain features: These features represent the spectral content of the audio signal. Examples of frequency domain features include:

- Mel-frequency cepstral coefficients (MFCCs)
- Chromagram
- Spectral centroid

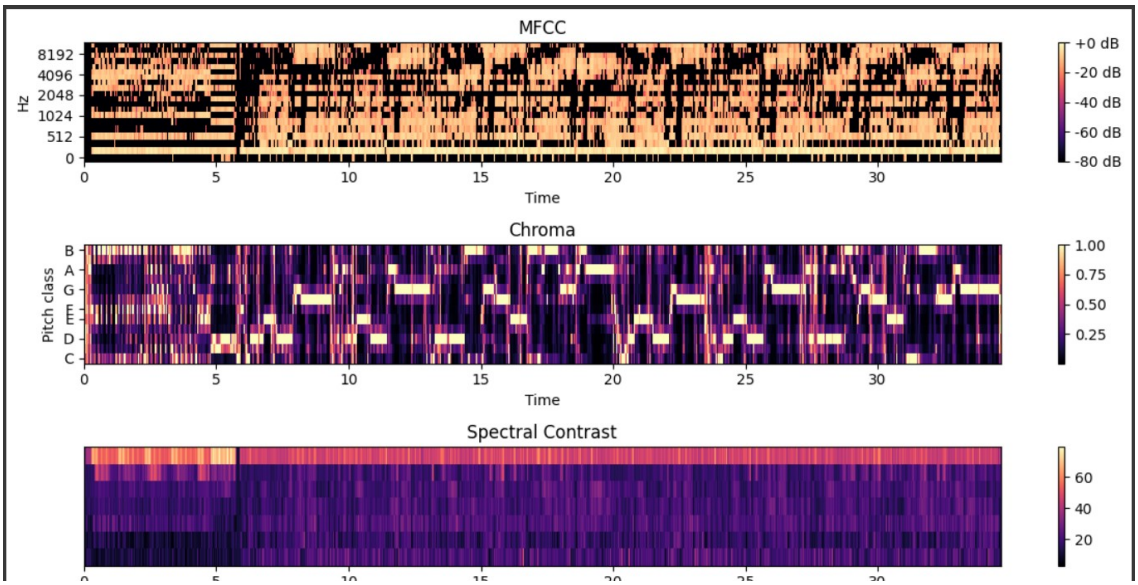
PROBLEM STATEMENT

Design and develop method for digital forensic of audio in order to understand the audio features using feature extraction.

SOURCE CODE

```
pip install librosa numpy matplotlib
import librosa
import librosa.display
import matplotlib.pyplot as plt
import numpy as np

audio_file = 'audio3.mp3'
y, sr = librosa.load(audio_file)
mfccs = librosa.feature.mfcc(y=y, sr=sr)
chroma = librosa.feature.chroma_stft(y=y, sr=sr)
spectral_contrast = librosa.feature.spectral_contrast(y=y, sr=sr)

plt.figure(figsize=(12, 6))
plt.subplot(3, 1, 1)
librosa.display.specshow(librosa.power_to_db(mfccs, ref=np.max), y_axis='mel',
x_axis='time')
plt.colorbar(format='%+2.0f dB')
plt.title('MFCC')

plt.subplot(3, 1, 2)
librosa.display.specshow(chroma, y_axis='chroma', x_axis='time')
plt.colorbar()
plt.title('Chroma')

plt.subplot(3, 1, 3)
librosa.display.specshow(spectral_contrast, x_axis='time')
plt.colorbar()
plt.title('Spectral Contrast')
plt.tight_layout()
plt.show()
```

RESULT / OUTPUT



CONCLUSION

Audio features are a powerful tool for extracting meaningful information from audio signals. They are used for a variety of tasks, including audio classification, speech recognition, speaker identification, and music information retrieval. Hence we studied how to do feature extraction of the audio file which can be used in digital forensic of the audio.

There is a need to develop new and more effective audio features, improve the performance of audio feature extraction algorithms, and make audio features more accessible and interpretable.