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In [1]: import librosa as lr
import numpy as np
from glob import glob
import csv
import os
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In [2]: data_dir='/home/vivek/Genre_Detection/genres'
#getting path of all the files with .au extension in a list
audio_files=glob(data_dir+'/blues'+ '/*.au')
list3=['/classical', '/country', '/disco', '/hiphop', '/jazz', '/metal', '/pop', '/reggae', '/rock']
for element in list3 :
    to_extend=glob(data_dir+element+'/*.au')
    audio_files.extend(to_extend)

len(audio_files)
```

Out[2]: 1000

FEATURES EXTRACTION

- 1.Zero Crossing Rate The zero crossing rate is the rate of sign-changes along a signal, i.e., the rate at which the signal changes from positive to negative or back. Librosa provides a numpy array on calling zero crossing rate feature,we consider its mean as our feature to recognize the genre
- 2.special centroid It indicates where the "centre of mass" for a sound is located and is calculated as the weighted mean of the frequencies present in the sound.
- 3.Spectral Rolloff It is a measure of the shape of the signal. It represents the frequency below which a specified percentage of the total spectral energy, e.g. 85%, lies.
- 4.Chroma features Chroma features are an interesting and powerful representation for music audio in which the entire spectrum is projected onto 12 bins representing the 12 distinct semitones (or chroma) of the musical octave.
- 5."Mel frequency cepstral coefficients" (MFCCs) The Mel frequency cepstral coefficients (MFCCs) of a signal are a small set of features (usually about 10–20) which concisely describe the overall shape of a spectral envelope we take a total of 20 features out of mfcc

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In [3]: #sample feature extraction of 1 audio file
#loading the audio
x, sr = lr.load(audio_files[0])

zero_crossings_rate= lr.feature.zero_crossing_rate(x)
print("zero crossing rate of the file is",np.mean(zero_crossings_rate))

spectral_centroids = lr.feature.spectral_centroid(x, sr)
print("spectral_centroid of the file is",np.mean(spectral_centroids))

spectral_rolloff = lr.feature.spectral_rolloff(x+0.01, sr=sr)
print("spectral_rolloff of the file is",np.mean(spectral_rolloff))

hop_length = 512
chromagram = lr.feature.chroma_stft(x, sr=sr, hop_length=hop_length)
print("chromagram of the file is",np.mean(chromagram))

mfcc = lr.feature.mfcc(x, sr=sr)
i=1
for e in mfcc :
    print("mfcc-",i,"of the file is",np.mean(e))
    i=i+1
```

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zero crossing rate of the file is 0.06402488761600927
spectral_centroid of the file is 1719.3689480431453
spectral_rolloff of the file is 3745.236878715922
chromagram of the file is 0.4088792475315122
mfcc- 1 of the file is -121.36393978375388
mfcc- 2 of the file is 122.50668277611376
mfcc- 3 of the file is -14.738196486513928
mfcc- 4 of the file is 46.13106758243983
mfcc- 5 of the file is -8.181879740271722
mfcc- 6 of the file is 20.182963511589787
mfcc- 7 of the file is -19.173378988374445
mfcc- 8 of the file is 23.03913980624283
mfcc- 9 of the file is -11.838224375787476
mfcc- 10 of the file is 21.15999922750906
mfcc- 11 of the file is -6.718366172387851
mfcc- 12 of the file is 6.99254229555463
mfcc- 13 of the file is -12.730597884510779
mfcc- 14 of the file is 5.061325371908128
mfcc- 15 of the file is -5.183214745325095
mfcc- 16 of the file is -1.4525600176884235
mfcc- 17 of the file is -7.041825170461076
mfcc- 18 of the file is 2.6952478619457327
mfcc- 19 of the file is 3.4123054719551718
mfcc- 20 of the file is -2.7156923750753332
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In [4]: #making a csv file
with open('genre_features.csv','w',newline='') as file :
    TheWriter=csv.writer(file)
    l=["file name","zero_crossings_rate","spectral_centroid","Spectral Rolloff","Chroma features"]
    i="a"
    for e in mfcc :
        x="mfcc"+"_"+i
        l.append(x)
        i=chr(ord(i)+1)
    x="genre"
    l.append(x)
    TheWriter.writerow(l)
    i=1
    for audio in audio_files :
        x, sr = librosa.load(audio,mono=True,duration=30)
        zero_crossings_rate=librosa.feature.zero_crossing_rate(x)
        spectral_centroids = lr.feature.spectral_centroid(x, sr)
        spectral_rolloff = librosa.feature.spectral_rolloff(x+0.01, sr=sr)
        hop_length = 512
        chromagram = librosa.feature.chroma_stft(x, sr=sr, hop_length=hop_length)
        mfcc = librosa.feature.mfcc(x, sr=sr)
        list1=[audio,np.mean(zero_crossings_rate),np.mean(spectral_centroids),np.mean(spectral_rolloff),np.mean(chromagram)]
        to_extd=[]
        for e in mfcc :
            to_extd.append(np.mean(e))
        list1.extend(to_extd)
        if i>0 and i<101 :
            x="blues"
            list1.append(x)
        elif i>100 and i<201 :
            x="classical"
            list1.append(x)
        elif i>200 and i<301 :
            x="country"
            list1.append(x)
        elif i>300 and i<401 :
            x="disco"
            list1.append(x)
        elif i>400 and i<501 :
            x="hiphop"
            list1.append(x)
        elif i>500 and i<601 :
            x="jazz"
            list1.append(x)
        elif i>600 and i<701 :
            x="metal"
            list1.append(x)
        elif i>700 and i<801 :
            x="pop"
            list1.append(x)
        elif i>800 and i<901 :
            x="reggae"
            list1.append(x)
        else :
            x="rock"
            list1.append(x)

        i=i+1
        TheWriter.writerow(list1)

```

In []: