"MUSICAL INSTRUMENT RECOGNITION USING MACHINE LEARNING TECHNIQUE"

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Abstract - *The integrated set of functions written in Matlab, dedicate to the extraction from audio tones of musical options connected to timbre, tonality, rhythm or type.*
A study on feature analysis In today's atmosphere, most of the retrieval algorithmic programs square measure matter based mostly algorithm so we have a tendency that cannot able to build classification of musical instruments. In most of the retrieval system the classification are often done on the premise of term frequencies and use of snippets in any documents. we have a tendency to gift MIR tool case, associate degree for recognition of classical instruments, using machine learning techniques to select and evaluate features extracted from a number of different feature schemes was described by Deng et al. The performance of Instrument recognition was checked using with different feature selection and ranking algorithms.

Key Words: *Musical instrument recognition, Mel Frequency Cepstral Coefficient (MFCC), Fractional Fourier transform (FRFT), Machine learning technique (KNN).*

1. INTRODUCTION

Recognizing the objects in the environment from the sound they produce is primary function of auditory system. The aim of Musical instrument recognition is to identify the name and family of musical instrument from the sound they produce. Many attempts were made for musical instrument Identification and classification. The statistical pattern-recognition technique for classification of some musical instrument tones with few features based on log-lag correlogram .

1.1Musical Instrument Classification:

Musical Instruments are classified as follow
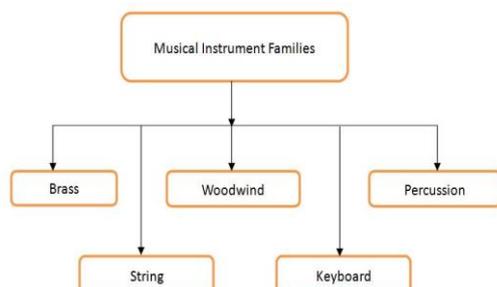
An outline of the set of options which will be extracted with MIR tool cabinet, illustrated with the outline of 3 explicit musical options. The tool cabinet additionally includes functions for applied math analysis, segmentation and bunch. The various musical options extracted from the audio files are extremely interdependent: particularly. Some options are supported same initial computations. So as to boost the procedure potency, it's necessary to avoid redundant computations of those common elements. Every of those intermediator elements, and also the final musical options, are so thought of as building blocks which will been freely articulated one with one another. In several existing audio retrieval system we have a tendency to extract the options either by linear prophetic code or by sensory activity linear prediction.

However in projected system for extraction we have a tendency to use musical data retrieval tool cabinet (MIR toolbox) that is helpful to seek out out audio descriptor by victimization hybrid choice methodology. Once finding audio descriptor we have a tendency to establish the musical instruments with the assistance of vector division. Given structural features of digital music files, appropriate information excerpts and "retrieval proxies" can help to automatically organize personal or commercial music collections. Our methods depend on the analysis of a similarity matrix.

The matrix contains the results of all possible pairwise similarity comparisons between time windows in the digital stream. The matrix is a better path to visualize and characterize the structure in digital media streams. Throughout, the algorithms presented are unsupervised and contain minimal assumptions regarding the source stream. A key advantage here is that the data is effectively used to model itself. The framework is intense general and should work on any ordered media such as video or text as well as audio. In particular, we have demonstrated results on segmenting both speech audio 4 and video streams 5 as well as music.

2. PROPOSED SYSTEM

In our proposed system we are going to extract the features of sound by recognizing the timbre of sound. After feature extraction we are making classification of sound on the basis of extracted features. For retrieving the audio data we use MIR tool box. MIR tool box has the set of multiple functions written in Matlab. Those functions are used to

extract the audio related features. In our proposed system our main aim is to find out the audio descriptor. To find out an audio descriptor from given data we use extracted features and hybrid selection method.

This method reduces substantially the many number of audio descriptors to few specific audio descriptors. The selected audio descriptors are then fed as input to further classifiers. After finding the correct audio descriptors we generate the feature vectors and we will identify the musical instruments by using vector quantization method. In vector quantization system, feature vector stores the extracted features of an audio descriptor and those extracted features will be matched with standard feature vector for comparison.
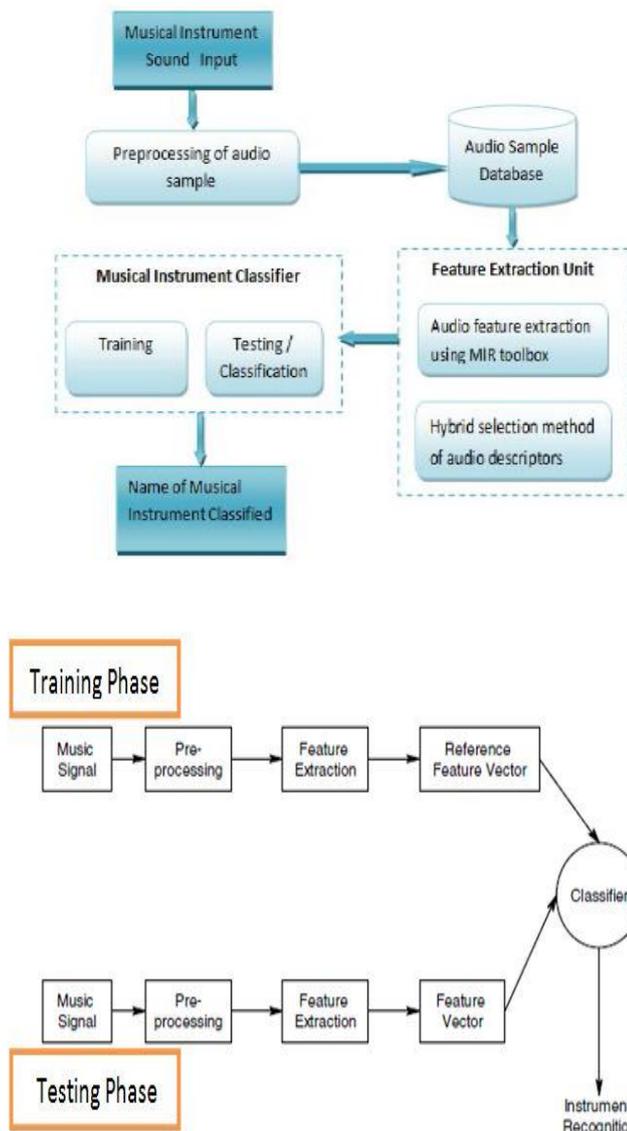
Training Phase:

In this phase set of known signal is used an input. The feature of known signal will be extracted and this feature stored in a matrix or vector format as a Reference Model which contain standard database for identification.

Testing Phase:

In this phase an unknown test signal will be given as an input and feature of the signal will be extracted. This feature can be compared with the standard features. By using classifier we are able to recognize which feature matching among the all feature. We are in position to recognize instrument and its family.

MIR Tool Box:

MIR Toolbox, an integrated set of functions written in Matlab, dedicated to the extraction from audio files of musical features related, among others, to timbre, tonality, rhythm or form. The objective is to offer a state of the art of computational approaches in the area of Music Information Retrieval (MIR). The design is based on a modular framework: the different algorithms are decomposed into stages, formalized using a minimal set of elementary mechanisms, and integrating different variants proposed by alternative approaches – including new strategies.

We have developed that users can select and parametrize. These functions can adapt to a large area of objects as input. MIR Toolbox is a Matlab toolbox dedicated to the extraction of musically related features in audio recordings. It has been designed in particular with the objective of enabling the computation of a large range of features from databases of audio files, that can be applied to statistical analyses. We chose to base the design of the toolbox on Matlab computing environment, as it offers good visualization capabilities and gives access to a large variety of other toolboxes.   An analysis of the specific features considered in the toolbox. All the different processes start from the audio signal and form a sequence of operations developed horizontally right wise. The vertical composition of the processes indicates an increasing order of involution of the operations, from simplest measurement to more detailed auditory modelling .Each musical feature is related to the different wide musical dimensions defined in music theory.

Machine Learning Technique (KNN):

KNN is non-parametric lazy learning algorithm. Non parametric means it does not make any assumption on the underlying data distribution. Its outstanding characteristic is that it does not require a training stage in the strict sense. The training samples are rather used directly by the classifier during the classification stage. The key idea behind this classifier is that, if we are given a test pattern (unknown feature vector), x, we first detect its k-nearest neighbors in the training set and count how many of those belong to each class. In the end, the feature vector is assigned to the class which has accumulated the highest number of neighbors. Therefore, for the k-NN algorithm to operate, the following ingredients are required:

1. A dataset of labeled samples, i.e. a training set of feature vectors and respective class labels

2. An integer k ≥ 1.
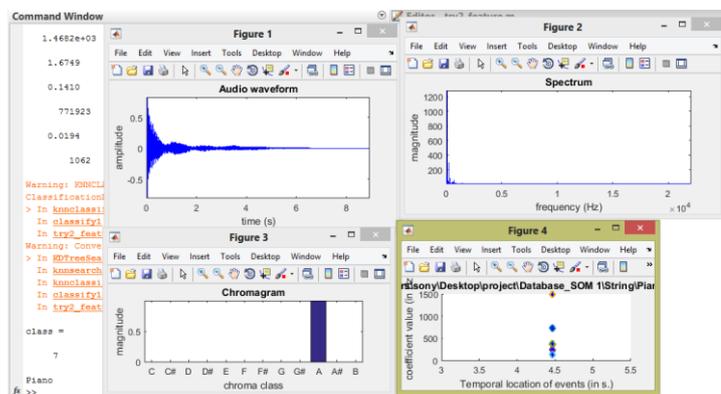
3. A distance (dissimilarity) measure.

3. FLOWCHART
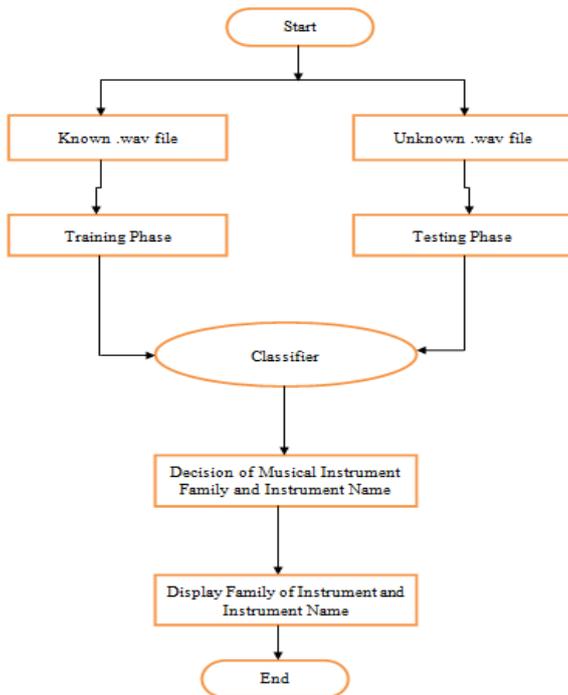
4. RESULT

Standard Database for Piano Instrument:

Features	F1	F2	F3	F4	F5	F6
Tone 1	1102	1	0	1014799	0	646
Tone 2	1421	2	0	767983	0	747
Tone 3	1381	2	0	513762	0	793

Input file: Unknown tone (.WAV/.MP3)
Extracted Feature values:

Features	F1	F2	F3	F4	F5	F6
values	1468.211	1.674	0.141	771923	0.019	842

Output: Piano

5. CONCLUSIONS

We have described a system that can listen the musical instrument tone and recognize it. The work began with reviewing Blind Source Separation and Musical Instrument Recognition. Features which make musical instrument distinct from each other are presented and discussed. The principle of classifier k-NN are described.

Features are extracted from approximated sources and normalized to keep less complex. The k-NN classifier is used to assess the testing data on this identification system. To make truly naturalistic evaluations, the acoustic data would be needed is more.

From the above discussion we can say that,If we find accuracy of identification with consideration of respective family of an instrument, all feature provide more improved result than those are with instrument wise identification. The process is become very complicated if we try to find best feature value of an individual instrument.

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