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AUDIO CLUSTERING USING DATA MINING

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ABSTRACT

Automatic genre classification from audio has been an area of active research due to its importance in music information retrieval systems. The clustering process in data mining is to arrange similar data into groups. The purpose of clustering algorithm is to divide s dataset into several groups that are similar within a group is better than among groups. The multimedia files grow day by day.

As concern of music and audio, millions of files spread every day. The automatic organization of these music or audio files is a difficult task. In this paper, we are identifying an approach which will make the clusters of music and audio files by accessing parameters like key, tempo, rhythm etc.

KEYWORDS: Dataset, Clustering, K-Mean

INTRODUCTION

Data mining offers great promise in helping organizations uncover patterns hidden in their data that can be used to predict the behavior of customers, products and processes. Data Mining is the process of identifying new patterns and insights in data.

As the volume of data collected and stored in databases grows, there is a growing need to provide data summarization by identify important patterns and trends. The music which in the olden days was limited to live concerts, performances or radio broadcasts is now available at everyone's finger tips within few clicks.

Music has thus become very easily accessible and available. Music is one of the most popular types of online information and there are now hundreds of music streaming and download services operating on the World Wide Web. Some of the music collections available are approaching the scale of ten million tracks and this has posed a major challenge for searching, retrieving and organizing music content [1].

The size of database in all applications is huge where the number of records varies from thousand to thousands of millions. The clustering is process in which algorithms are applied to discover similar data and make a group of that data.Automatic clustering of music into different group is important as a way to organize large number of music or audio files on the web. Different clusters of music and audio can be different according to their parameters.

Musical databases are easily accessible over computer networks through internet. It is basic need to organize such database in better manner because music is a multifaceted, multi-dimensional medium, it demands specialized representations, abstractions and processing techniques for effective search that are fundamentally different from those used for other retrieval tasks.

Music emotion detection and classification has been studied and researched before. Initially most of them adopted pattern recognition approach. The research area of music data mining has gradually evolved during this time period in

order to address the challenge of effectively accessing and interacting with these increasing large collections of music and associated data such as styles, artists, lyrics and music reviews. The system's aim to discover the connections between emotions and affective features and based on that features predict the emotions from music automatically.

Today, the overall music collection can count to a few millions of records in the whole world and still continue to increase every day. As it is a well established fact that music indeed has an emotional quotient attached with it, it is very essential to know what are the intrinsic factors present in music which associate it with particular emotion.

The research is going on in capturing various features from the audio file based on which we can analyze and classify a list of audio files.

Audio features were initially studied and explored for application domains like speech recognition [2]. Clustering is also a data mining task of discovering groups and structures of data which are in some way similar to each other and differ in similar way from other groups.

RELATED WORK

This section reviews some of the related work on affective music mining. There is a large body of previous work on mining affective features from music e.g., music recommendation according to emotions, Indian music genre of songs is a difficult task.

The performance of various features extracted from the audio signal in terms of the separability of the five classes of Indian music using Gaussian mixture model and knearest neighbour classifier.[3]

There is a joint emotion topic model by augmenting latent Dirichlet allocation with an intermediate layer for emotion modeling. Music elements which affect the emotion include melody, rhythm, tempo, mode, key, harmony, dynamics and tone color.

Among these music elements, melody, mode, tempo and rhythm have stronger effects on emotions. In this research we will develop a system which aim to discover connection between different features like melody, rhythm etc and evaluate social emotions.

We will make a data set which contains different discrete values of features of particular audio. To get the discrete values we used music tools like audacity.

The system will make clusters and do classification by mining discrete values from data set. [4] We will make that this system also applicable for online audio.

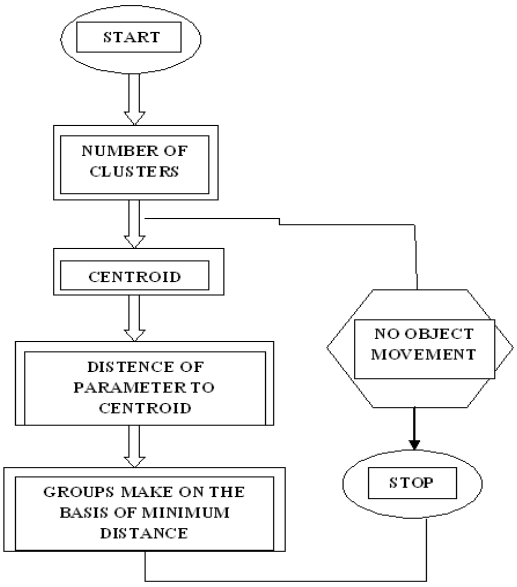
CLUSTERING ALGORITHM

In the k means clustering algorithm, the first parameter that needs to be specified is the value of K that is the number of clusters. After this value determined, these k points are chosen as cluster centers.

All instances that need to be classified are assigned to their closest cluster center, according to simple Euclidean distance metric.

Next, the centroid or the mean of all instances in each cluster is calculated. These center or mean values are taken to be the new center values for their respective clusters.

The process is then repeated iteratively until the same points are assigned to cluster centers in consecutive rounds, at which stage the cluster centers are stabilized and do not change after this point.[5]



FEATURES TO PREDICT EMOTIONS

When you listen to a piece of music, you notice that it has several different characteristics; it may be soft or loud, slow or fast, combine different instruments and have a regular rhythmic pattern. All of these are known as the elements of music. Music consists of numerous features. Among them, pitch, rhythm, timbre, and dynamics are considered to be the most semantically important ones in particular; pitch carries the highest relative weight of information followed by rhythm. [6] The feature selection and extraction process can be separated based on the representation of the music piece in symbolic and acoustic feature extraction, while the former can also be divided into monophonic, homophonic and polyphonic.

Melody: It refers to the tune of a song or piece of music. It is the memorable tune created by playing a succession or series of pitches. Melody is the main tune of a song; the outcome of a series of notes. Melody is regarded as “horizontal” because its notes are read from left-to-right. Melody is a musical and successive line of single tones or pitches perceived as a unity. Melody is the tune of the music. If you hear a song, the line that you would probably sing is the melody.

Rhythm: It may be defined as the pattern or placement of sounds in time and beats in music. Roger Kamien in his book Music: An Appreciation defines rhythm as "the particular arrangement of note lengths in a piece of music. [8]" Rhythm is shaped by meter; it has certain elements such as beat and tempo.

Tempo: The speed at music is or should be played. The Italian word at the beginning of a music piece that indicates how slowly or fast the piece should be played. This is called the tempo which is effective throughout the duration of the music unless the composer indicates otherwise.

Pitch: The relative lowness or highness that we hear in a sound. The pitch of a sound is based on the frequency of vibration and the size of the vibrating object. The slower the vibration and the bigger the vibrating object, the lower the pitch; the faster the vibration and the smaller the vibrating object, the higher the pitch.

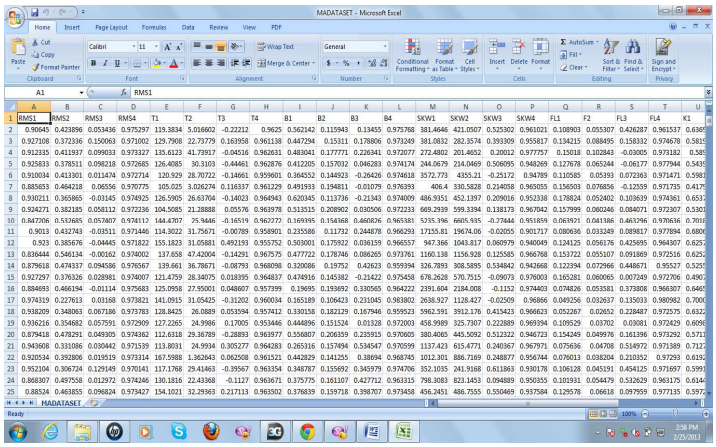
Harmony: Harmony is produced when two complementary notes sound simultaneously. Harmony is found in chords or can be played along a main melody. Harmony is being vertical because harmony is only achieved when notes are played at the same time. Melody, on the other hand, is “horizontal,” since its notes are played in succession and read horizontally from left-to-right.

Key: In music a key is the major or minor scale around which a piece of music revolves. A song in a major key is based on a major scale and a minor key is based on a minor scale.

Texture: Texture refers to the number of individual musical lines and the relationship these lines have to one another.

DATASET FOR CLUSTERING

Dataset: dataset is a collection of related sets of information that is composed of separate elements. [9]



Dataset for clustering contain values of different parameters to predict emotions from the music. Is has been collected by using professional music tools.

EXPERIMENT AND RESULTS

The Weka Knowledge Explorer is an easy to use graphical user interface that harnesses the power of the weka software. Each of the major weka packages Filters, Classifiers, Clusterers, Associations, and Attribute Selection is represented in the Explorer along with a Visualization tool which allows datasets and the predictions of Classifiers and Clusterers to be visualized in two dimensions. [7]

Preprocess Panel

The preprocess panel is the start point for knowledge exploration. From this panel you can load datasets, browse the characteristics of attributes and apply any combination of Weka's unsupervised filters to the data.

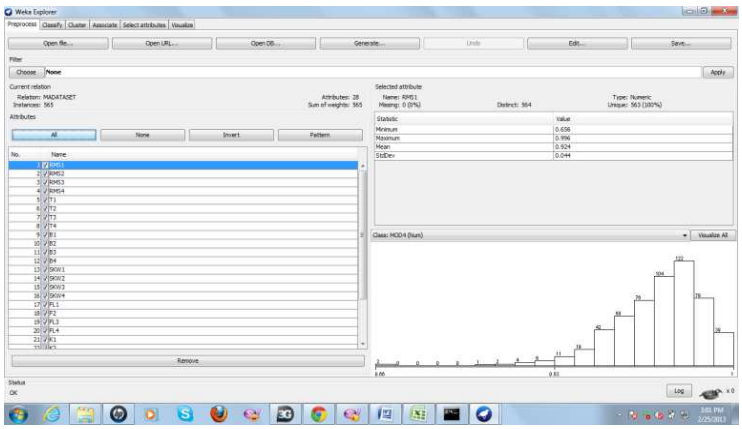


Figure 1: Visualization of Parameters

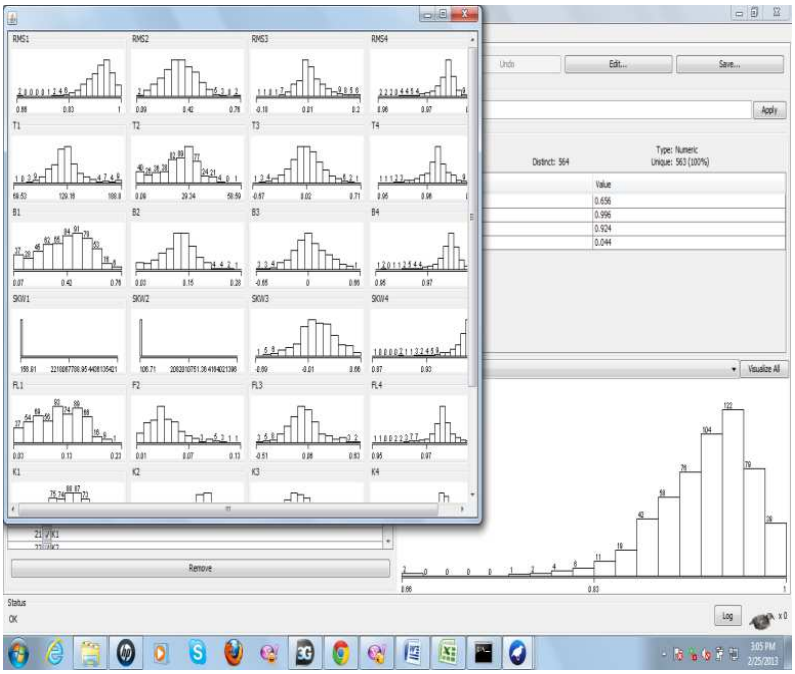


Figure 2: Visualization of All Parameters

Cluster Panel

From the cluster panel you can configure and execute any of the weka Clusterers on the current dataset. Clusters can be visualized in a pop-up data visualization tool.

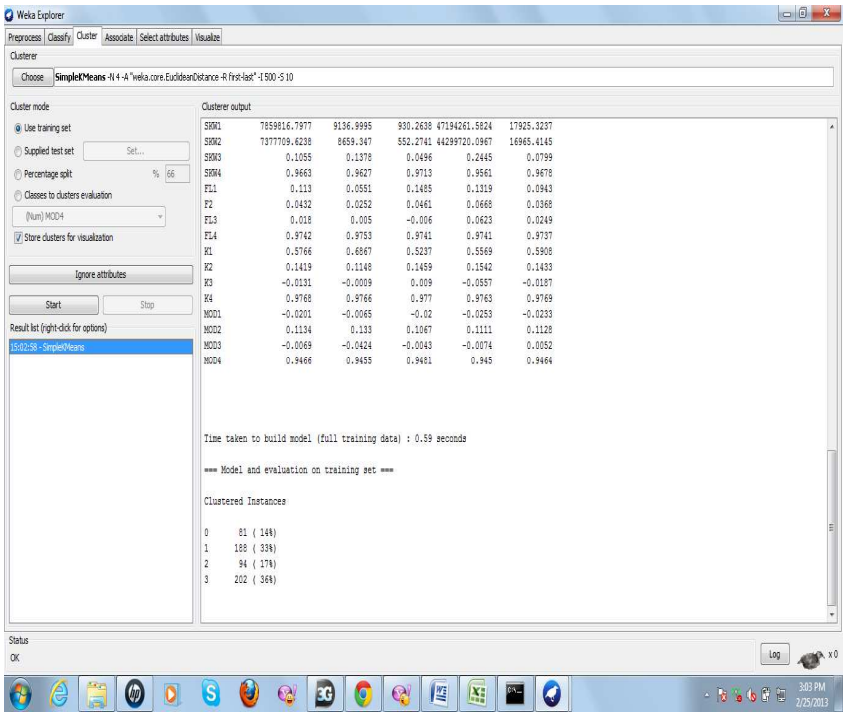


Figure 3: Result of Clustering

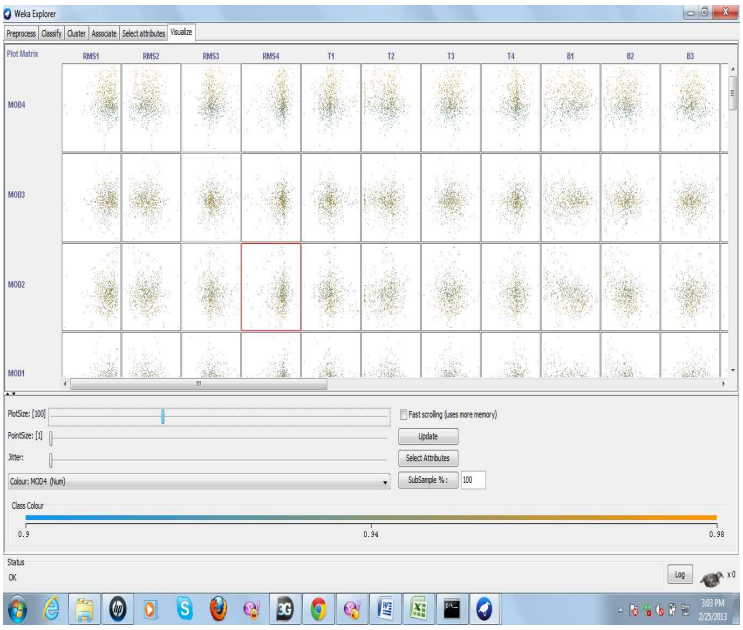


Figure 4: The Graphical Distribution of the Data in the Data Set

CONCLUSIONS

In this paper, we present a new problem that is making the cluster of audio by getting its parameters values by using audio tools and weka. The work has been done up to clustering of music and audio through these parameters. As for future work, we are planning to classified music and audio by the result of clustering. Classification after clustering will improve the result.

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