Music Prediction Using Musical Subjective Features

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Abstract: There are many online music services are available with huge number of musical tracks. So, people are getting more time for searching the music according to their taste. Recommendation is the way to solve that problem. Recommendation can be better if music feature selection is done in a proper way. Music has Editorial property e.g. album, artist etc. and subjective property e.g. acoustic, loudness etc. As per research found that music is a subjective. It is better to use subjective features for recommendation because different people may have different kind of perception for same music. Here, subjective features of music are analyzed and music genre category is identified. This is used for base of recommendation method. This paper contains technique to cluster music based on feature attribute value using Spotify API and K mean clustering Algorithm is used to match music attribute value with cluster centroid value. The result is used to predict the music based on different attribute value.

Index Terms – **K-mean, Spotify, Accuracy**

I. INTRODUCTION

Music is the only thing a person can feel even if with the close eyes and enjoy life whatever the circumstances life may have. The persons generally listen to music according to their mood. There are different types of music genres are available and person can listen music as per their liking of genres. Music has number of features which can be extracted to perform Clustering. E.g. Music has Signal property which included Zero Crossing rate (ZCR), RMS, peak, centroid, tempo [2]. A number of works has been done in music recommendation by using these features also. Music can be classified according to genres. Every music genre has different values. E.g. Rock music has fast rhythms and beats, Classical is soft kind of music [3]. To Cluster music according to attribute value wise K mean algorithm is used which is used to predict music genre. To listen music according to genres are very useful because genre somewhat belongs to people mood. There are different circumstances when people want to listen soft music when they are happy and rock when they are sad.

Currently music recommendation uses Content-Based and Collaborative approach. Content –based method is used to recommend the music based on user's playlist. Then user playlist contents are analyzed music feature attributes and recommends music based on music features similarity found. Clustering is used to store similar kind of music and later can be used to recommend. Collaborative method provides recommendation based on music content sharing and rating provided to music [4].

II. RELATED WORK

Minseo Gong et al. have proposed a technique to identify musical taste based on analysis on music metadata. They extracted music signal property Zero crossing rate, Spectral Centroid, Spectral roll off, spectral flux etc. using JAudio tool and compares the accuracy with classification algorithm. Moreover, they concluded that accuracy is increase [4].

Danny Diekroeger used naïve Bayes classifier to classify the songs based on lyrics. They concluded that only lyrics-based classification is not that much accurate [5].

These techniques include only signal features and not subjective features. To group music features K mean algorithm is used and is a subjective task to have quality result.

III. FEATURE EXTRACTION AND DATASET

Most researchers mainly focus on audio signal features for music genre prediction. Here, subjective features of music are measured to predict music into particular genre with accuracy. Spotify is a digital music service that gives you access to millions of songs. Spotify provides access to over 30 million songs, with more music being added every day. As of June 2016, Spotify has 100 million monthly active users, and as of September 2016, it has 40 million paying subscribers [6].

It provides web developers SpotifyID by registering to website. Though usage of SpotifyID user can access the website and as website contains a million of songs, each song contains TrackID through which feature attributes of music object is retrieved in JSON (JavaScript Object Notation) format using a link https://api.spotify.com/v1/audio‑features .
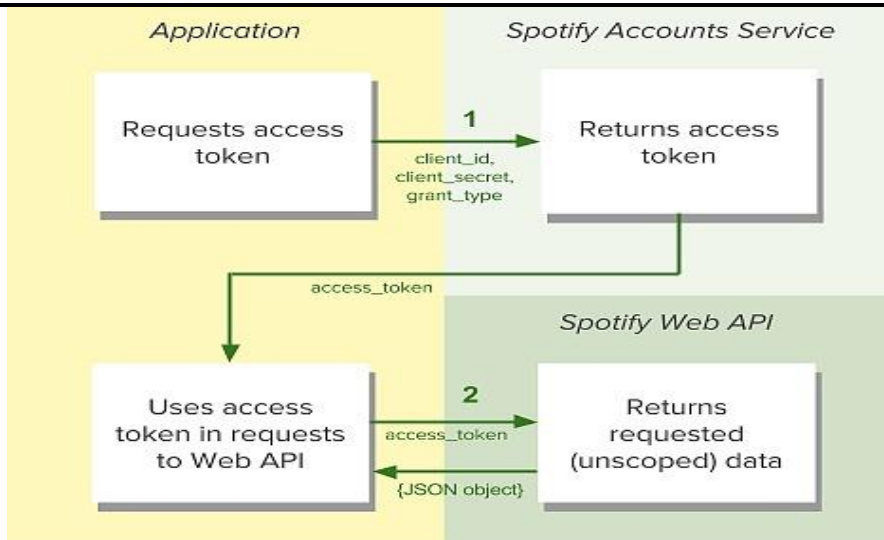
Figure 1 Process through Spotify API to get attributes features of music object [6]

Music Features	Range	Description
Energy	0.000000 to 1.000000	Fast, loud, noisy track represents measure of intensity and activity.
Liveness	0.000000 to 1.00000	Detects presence of audience.
Tempo	0.000 to 0.250	Speed of average beat duration.
Speechiness	0.000000 to 1.000000	Detects presence of Spoken Words.
Acousticness	0.000000 to 1.000000	Detects whether the track is acoustic or not.
Dancibility	0.000000 to 1.000000	Combination of Rhythm, Beat & Overall Regularity. 0.0 Least danceable and near to 1.0 most danceable.
Instrumentalness	0.000000 to 1.000000	Detects whether track contains no vocal.
Loudness	-60 to +60	Represents quality of sound and correlates to physical amplitude.

Table 1 Music Feature Attribute Information [6]

The above music features are collected using java program from Spotify website. The music features are downloaded in JavaScript Object Notation (JSON) format using Spotify API for 11 music genres. We have dataset of 11 music Genres files Acoustic, Blues, Classical, Country, EasyListening, IndianClassical, Jazz, Metal, Rap, Reggae, Rock music. The music feature attributes are written into .dat files. To predict music, every genre attribute value is generated and Attribute value is combination of binary value 0 and 1.

IV. EXPERIMENTAL SETUP

K-Mean Algorithm [7]: This is portioning based algorithm used to cluster music objects according to attribute value wise. grammar.

Algorithm [7]:
1. Select k points as initial centroids.
2. Repeat
3. Form k clusters by assigning all points to the closest centroid.
4. Re-compute the point of each cluster.
5. until the centroids don't change

$$d(i,j) = \sqrt{\left|x_{i_1} - x_{j_1}\right|^2 + \left|x_{i_2} - x_{j_2}\right|^2 + \ldots + \left|x_{i_p} - x_{j_p}\right|^2}$$

Figure 2 Euclidean Distance Formula [7]

V. RESULTS

Accuracy = sum of higher values/Total songs* Attributes

The java program runs on individual dataset of 11 genres. To extract music feature attributes from a TrackID, we need to enter specific TrackID to spotify website and from there also need to generate Token. Every Token is valid for at least 30 minutes. As a result of Token Authentication, music feature attribute are returned with its value. We need to pass the curl commend with TrackID and resultant token to retrieve music feature attributes which is done using JAVA program.

CURL is a command line tool and library for transferring data with URLs. CURL is used in command lines or scripts to transfer data. It is also used in cars, television sets, routers, printers, audio equipment, mobile phones, tablets, settop boxes, media players and is the internet transfer backbone for thousands of software applications affecting billions of humans daily [8].

Figure 3 Output of Music Feature Attribute Using CURL Commend

This result shows values of Energy, Liveness, Tempo, Speechiness, Acoustiness, Dancibility, Instrumentalness and Loudness of a Track. Based on cluster attributes values made using K–Means Clustering Algorithm, a base of how would be the value if music would be of a particular genre can be identifies with accuracy.

Figure 4 Output of K – Mean Algorithm for One Genre with Accuracy

% = Sum of Higher Values / Total Songs * Attributes
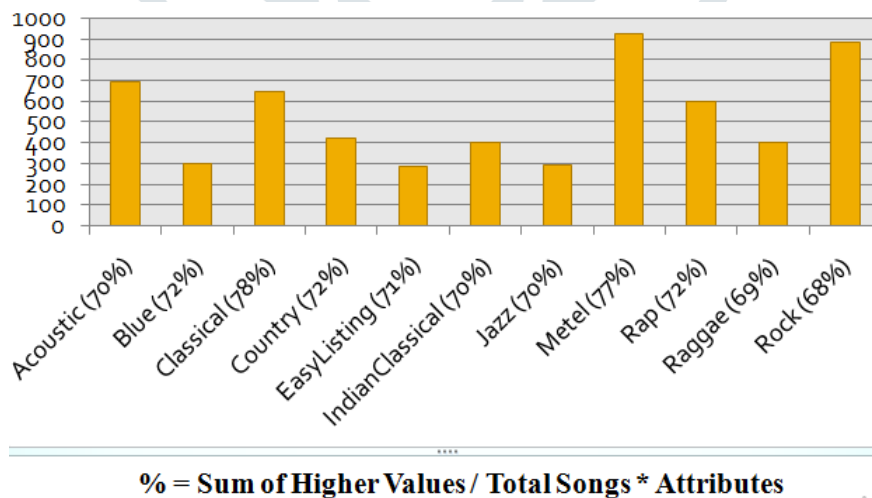
Figure 5 Music with Cluster Accuracy

Figure 6 Output of K – Mean Algorithm of 11 Genres with Accuracy

Upon matching result fetch by curl command for music object attributes value and result fetch by K – Mean Algorithm for Cluster Attribute value, we can predict music object genre category and from that easily recommend to user.

VI. Conclusion

Here, K – Means Algorithm is used to group similar types of genres attribute value wise. The output of k mean algorithm is attribute value. Attribute value is decided based on low and high value of music feature attribute. If music feature attribute value is between 0 to 0.5 then set 0 and if between 0.6 to 1.0 than set as 1. Here, there are total 8 music feature attributes are extracted, so the generated attribute value is combination of 0 and 1 with total 8 values with music genre accuracy. As a conclusion of k mean output, we can predict music genre of any new music based on cluster centroid feature attribute value.

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