Research on the Influence of Music

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Abstract: From ancient times to the present, music has been a special way of human information transmission. First, analyze and establish The Music Information Network Model Based on Knowledge Graph from the three levels of macro, micro, and middle levels, with genres and artists as the main objects, and use multiple linear regression to establish a Solving model of "Music Influence": mg = 0.857123ng + 0.142877bg. The "Music Influence" index obtained by this model reflects the comprehensive influence ability of the artist's influence on the population and the breadth of genres. Additionally, using Canonical Correlation analysis to establish a similarity measurement model. Using the Pearson correlation coefficient, the analysis of artists within the genre and the artists between the genres found that the similarity of artists of the same genre is high and stable, and the similarity of artists of different genres is low. Comparing an artist from two artists in another genre, the results are closer.

1. Introduction

Music is an important part of cultural heritage and plays an important role in people's lives. Music genres have undergone major changes along with social changes, and many artists have contributed to this change. With the advancement of data and scientific information, musicians and music-related data collected with modern technology provide a basis for more accurate analysis of the impact of previously produced music on new music and music artists. Therefore, using these data to establish a model to measure the influence of music and to more accurately analyze the impact of previously produced music on new music and music artists is a key link in predicting the evolution and revolutionary trends of artists and genres.

2. Music Information Network Model

This part will establish a multi-level network analysis model to analyze the influence structure of music groups and individuals from three levels: macro, micro and middle.
- At the macro level, by selecting the average value of each music feature of genre members, the sum of the number of works, and the classic value of artist_start as the reference standards for each

genre (the specific values have been obtained in the process of 4.1 data preprocessing), and use these values Let each genre make a macro comparison and judge the parent-child relationship of the genre.

  • At the micro level, we specifically study the degree of mutual influence of the members of the genre and connect the artists.

  • At the middle level, artists and genres are connected through the direct relationship, combined with macro-level and micro-level analysis to strengthen the Music Information Network Model, and obtain and analyze indicators of "music influence".

2.1 Creation and Analyze a Knowledge Graph

On the macro level, use the genre name as the head, and select the music characteristics, members, and artist_start as the attributes of the genre (first-level index), and then link these attributes with the names of their corresponding specific information (second-level index), And then add and connect specific attribute values, and finally form The Knowledge Graph of Genre Information (The Macro Knowledge Graph). At this point, when we need a specific piece of information, we can search from the head, and layer by layer through the connected index to search for the required data [4].

Similarly, at the micro level, using the name of the artist as the head, select music features, followers, works, and artist_start as attributes of the genre (first-level index). Then connect these attributes with the names of their corresponding specific information (secondary index), and then supplement and connect specific attribute values, and finally form The Knowledge Graph of Artist Information (The Macroscopic Knowledge Graph).

At this point, when we need a specific piece of information, we can search from the head, layer by layer through the connected index to search for the required data.

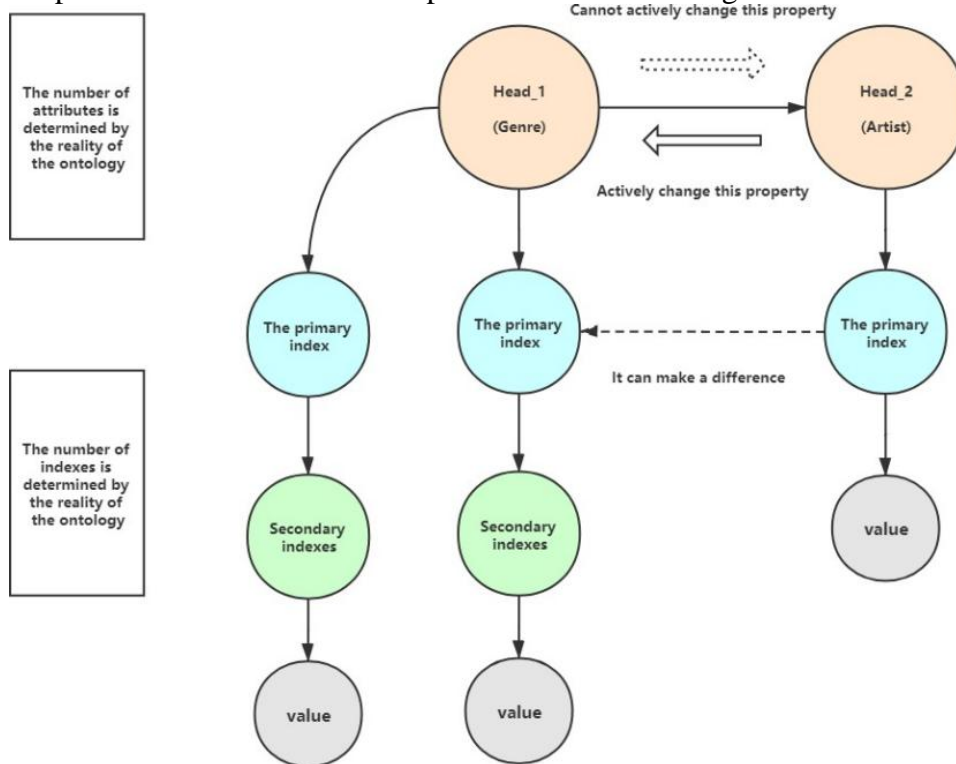The various specific structures and search process are shown in figure 1.

Figure 1: Structure and process explanation diagram of The Macro Knowledge Graph.

2.2 Solving model of "Music Influence"

After the initial creation of all The Macroscopic Knowledge Graphs, the influence relationship between genres and genres, artists and artists will be sought and analyzed.

(1) The relationship of influence between genres

First, use the influence_data to obtain the influence relationship between the genre and the genre, and obtain the inheritance relationship of the genre based on the sequence of the percentage of the number of people affected by the genre Pij and the value of artist_start yei of the genre. Then use the Euclidean distance clustering method to classify the schools based on the inheritance tree relationship. The Euclidean distance solving equation is as shown in equation (1).

$$d = \text{sqrt}((P_{ij} - P_{ji})^2 + (ye_i - ye_j)^2) \tag{1}$$

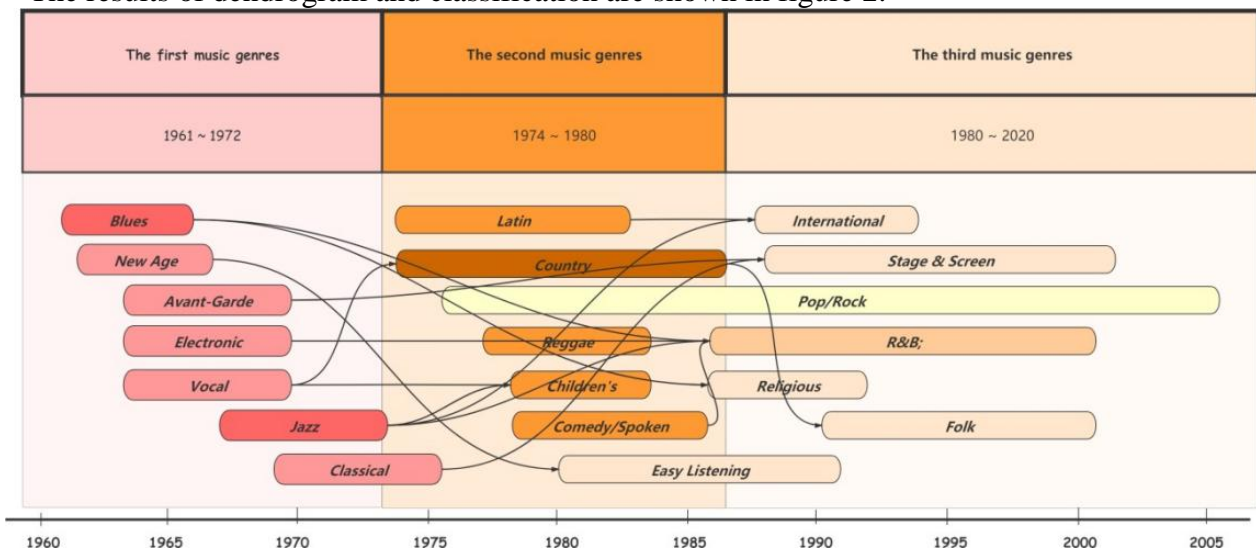The results of dendrogram and classification are shown in figure 2.

Figure 2: Dendrogram about inheritance and classification of genre.

The above figure does not reflect Pop/Rock's inheritance and the situation, here to describe and analyze:

Through the analysis of the data, we can see that the Pop/Rock genre is a diversified group, and all genres have had different effects on the members of Pop/Rock. Among them, Jazz, Blues, Country and R&B have significant influence on members of the Pop/Rock genre. Therefore, it needs to be dealt with in more detail when analyzing the "music influence" indicators of members of the Pop/Rock genre. In the subsequent correlation analysis and K-means cluster analysis, the Pop/Rock genre and its members will be further described and analyzed.

After getting the above process, obtaining the number of influence n and the value of influence b of the genre, and use multiple linear regression to establish a model to obtain the "music influence" indicator of the genre:

$$m_g = a_1 n_g + a_2 b_g \tag{2}$$

Among them, a1 and a2 represent the weights of n and b respectively, and use Python to realize the entropy weight method processing on the data (see Appendix A for the software running code), and get the weight corresponding to each indicator, as shown in table 1.

Table 1: Weight value of the number of influence and the corresponding scope of influence.

The index name	The weight
a_1	0.142877
a_2	0.857123

The specific model is as shown in equation (3).

$$m_g = 0.857123 n_g + 0.142877 b_g \qquad (3)$$

(2) The relationship of influence between artists

Through the analysis between genres, we have obtained the "music influence" indicators of different genres. Add this indicator to each of The Knowledge Graph of Genre Information, and these indicators can be searched by members belonging to this genre, and then used as a parameter to obtain the artist's "music influence" indicator.

Similarly, for obtaining the "music influence" indicator of an artist, we select the number of the artist's influence na, the genre ba influenced by the artist, and the "music influence" indicator mg of the genre as the parameters. Use Python to implement the entropy weight method processing of the data (see Appendix A for the software running code), and get the weight corresponding to each indicator, as shown in table 2.

Table 2: Weight value of artist's influence na, breadth of influence ba and genre mg.

The index name	The weight
a_3	0.184425
a_4	0.432596
a_5	0.382979

The model to obtain the "music influence" indicator of the artist is as shown in equation(4).

$$m_g = 0.184425 n_a + 0.432596 b_a + 0.382979 m_g \qquad (4)$$

Use the above model to obtain the "music influence" indicators of all artists. Bring the "music influence" indicator of artists into their respective The Knowledge Graph of Genre Information.

2.3 Create a music information network

After obtaining the knowledge graph of genres and artists and the "music influence" indicators, they are connected through direct correspondence to construct a Music Information Network Model Based on Knowledge Graph. Here we choose the network composed of the Avant-Garde genre and the New Age genre for display, as shown in figure 3.

By creating Music Information Network Model Based on Knowledge Graph, we can get music information more easily. The "music influence" indicator reveals the influence ability of artists and genres. Network visualization combined with the quantitative data of the "music influence" indicator is very helpful to solve problems such as the establishment of similarity measurement models and the judgment of revolutionaries of various genres.
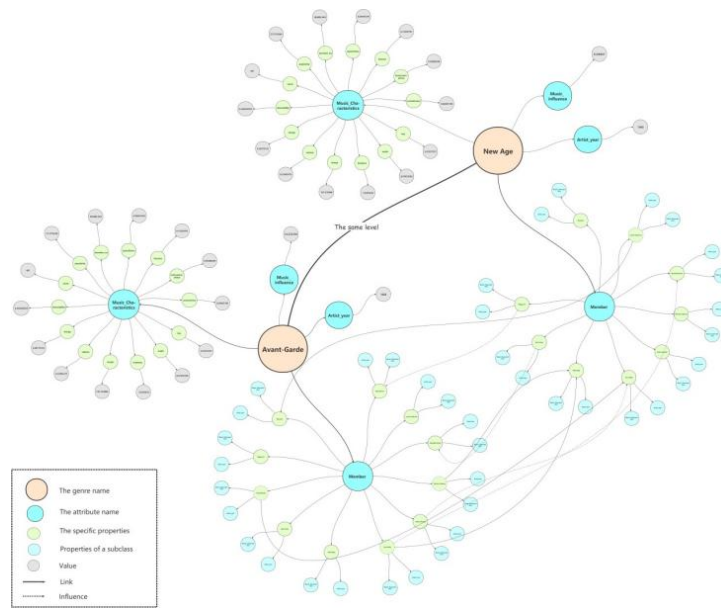
Figure 3: Music Information Network Model Based on Knowledge Graph.

3. Model Evaluation

3.1 Advantages of the model

For the acquisition of weights, we use the entropy method, which is more objective and makes the establishment of the model more realistic and reliable. Continuously improve the optimization model based on the actual situation and data structure, making the model built more comprehensive, scientific and reasonable. Based on the time series, a music development prediction model is established, which can better predict the key links of the changing trend of the music system.

3.2 Disadvantages of the model

The solution method is single, and multiple algorithms are not combined, and the result may have a certain error with the optimal solution

References

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