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Research on Music Influence Based on Analytic Hierarchy Process

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Abstract: Artists are often influenced by many factors in the creation of music. In addition to their personal experience and external environmental factors, they are also influenced by the music created by other artists. In this paper, by considering the inner relationship and characteristics of music, the methods of analytic hierarchy process (AHP) is used to establish a model which can measure the influence of music, and analyzes the influence of music. We use AHP to calculate the influence of influencers on followers, using the weight as a parameter for "musical influence". According to the graph theory and the weights obtained, a weighted directed graph is drawn to create a directed network of musi-cal influence, where influencers are connected to followers.

1. Introduction

Music is an art form and cultural activity that is part of human society. As early as hu-man beings have not produced language, they have learned to use the strength of sound to express their thoughts and emotions. Music is often used to express people's thoughts and feelings and social real life, which has a great influence on people and their lives. Artists who make music are influenced by many factors, such as personal experience, environment, and the development of relevant technology, as well as the music produced by other artists. Over time, music is constantly changing and developing, sometimes revolutionary changes occur to the emergence of new music. The emergence of new genres can also influence the creation of music in existing genres. By considering the interrelationships between music and their characteristics, we build a model to measure the influence of music in order to understand the interaction between artists and the development of music in society over time.

2. Analytic hierarchy process (AHP)

In order to establish the directional network relationship of music influence, we use the analytic

hierarchy process (AHP) for modeling.

·Data Processing

Firstly, we need to define the parameters of "musical influence". According to the principles, if the follower and the influencer belong to the same genre, then we consider the follower to be influenced by the influencer, and then determine the weight of the influence according to the year. If the follower is different from the influencer, it is considered that the follower is not influenced by the influencer, and the weight is 0.

Therefore, if logic statement is used for the statistics of the genre of influencers and followers. If the condition is: influencer_main_genre = follower_main_genre, set the logic value to 1, otherwise 0, to get the initial parameter of "music influence".

·The Model

We use AHP (the steps are as follows) to calculate the weight of influencers' influence on followers in different generations, that is, the weight represents the influence of influencers on followers' music.

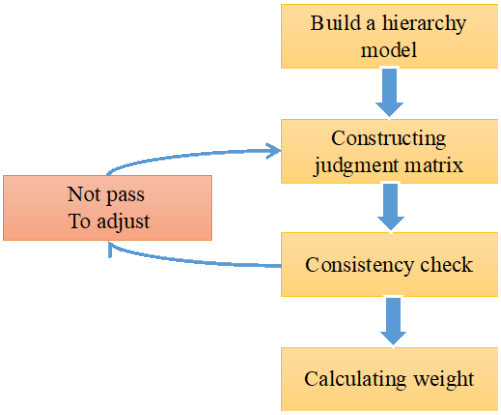

Figure 1: The main steps of AHP

According to the data given in *influence_data*, starting from the year in which influencers started their music career, the years in which their followers started their music career were divided into 5 layers, with one layer for each era. The specific influence system is shown in the following table.

Table 1: Influence system table

The target layer	Influence layer (the time at which a follower starts his musical career)
The influence of influencers on followers	In 10 years
	10 to 20 years
	20 to 30 years
	30 to 40 years
	40 to 50 years

According to the given data and related information [1], we construct the following judgment matrix. The consistency test result of this judgment matrix is: CR =0.0972. This result is less than 0.1, so the weights obtained using this judgment matrix are available.

Table 2: Judgment matrix

	In 10 years	10 to 20 years	20 to 30 years	30 to 40 years	40 to 50 years
In 10 years	1	1/2	1/3	1/5	1/9
10 to 20 years	2	1	1/2	1/4	1/6
20 to 30 years	3	2	1	1/4	1/7
30 to 40 years	5	4	4	1	1/1
40-50 years	9	6	7	4	1

3. Conclusion

After the consistency test, we obtained the influence weight results of influencers on followers' music as shown in the following table.

Table 3: Influence weight table

	The weight
In ten years	0.0428
10 to 20 years	0.0695
20 to 30 years	0.0972
30 to 40 years	0.2362
40 to 50 years	0.5543

The weight obtained is taken as the parameter of "music influence". Among them, if the genre of the influencer is different from that of the follower, it is considered that the influencer has no influence on the music of the follower, and the weight is 0.

According to the weight, we use "graph theory" knowledge of the weighted directed graph, connect the influencers to followers, thus get a vast network of music influence. The number marked on each arrow is the index of "musical influence" of the influencer on followers corresponding to the arrow. A weighted digraph corresponding to a fixed influencer is selected as the subset of the music influence network, and a total of 3774 directed influencer networks can be obtained. Here we choose 3 subnets for display.

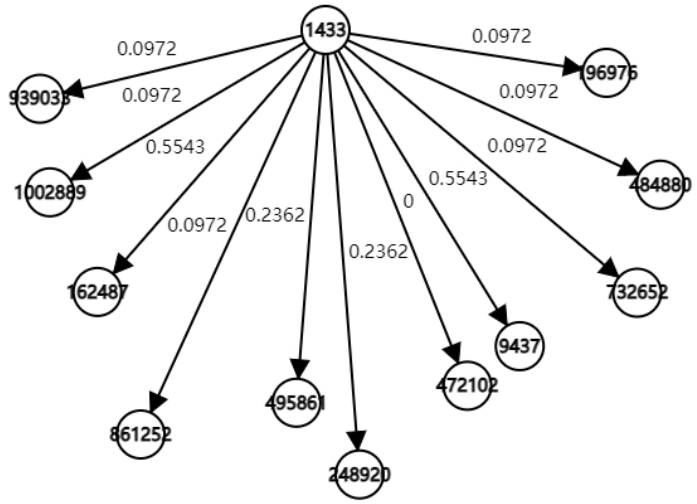

Figure 2: Influencer id 1433 artist's music influence network

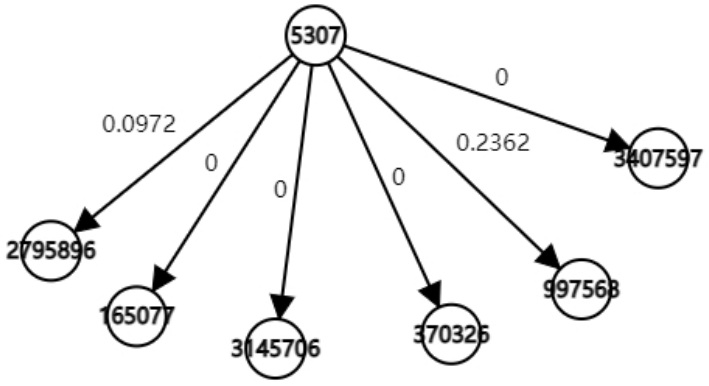

Figure 3: Influencer id 5307 artist's music influence network

Figure 4: Influencer id 12644 artist's music influence network

References

[1] Shubai Xu. Practical Decision-making Method: The Principle of Analytic Hierarchy Process [M]. Tianjin University Press, 1988.