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Construction and exploration of emotion model under the theory of musical emotion analysis

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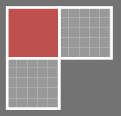
ABSTRACT

The process of musical emotion analysis is a rather complex analysis activity. It needs effective understanding of its musical emotion characteristics thus to make analysis thoughts maintain accurate accordingly which has significant impact on this study. Besides, the other key part is to conduct effective analysis and processing by model construction, and then the study process would be more scientific and reasonable. From the point of view of appreciators, factors of the formation of musical emotion is rather complex which needs constant improvement of the model. In this way, the analysis process of musical emotion can be strengthened real-timely. Combined with this principal line, this study conducts research and discussion. Among it, specific arrangements would be made through corresponding mathematical matrix model, which can provide solid theoretical and data basis. Meanwhile, this study will do effective dissertation of specific procedures of model construction to bring solid theoretical basis for the constant improvement of the practical value of the model.

KEYWORDS

Musical emotion; Emotion model; System analysis; Construction research.



INTRODUCTION

Effective excavation and integration of musical emotion factors should be done in the analysis process of musical emotion. It requires to build corresponding model for model data to be specifically analyzed, thus to provide strong support for the effective judgments of the musical emotion. This paper explores in depth according to the basic characteristics of music emotional and expounds its subjectivity, objectivity, fuzziness and hierarchy in details. In addition, this paper conducts corresponding research on emotion model of emotional stress and expounds its existing limitations elaborately. In the meantime, effective construction of computing model of musical emotion is established to make the analysis process of musical emotion can obtain effective data support. The significant effect of membership function in the model construction process can be cleared by enumerating the matrix. Later, this paper makes effective dissertation of the computing model construction process on the basis of semantic similarity, which makes the model research process more specific and complete. Effective illustrations of the model application process are also given to provide a solid practical basis for this study.

BASIC CHARACTERISTICS OF MUSICAL EMOTION

The so-called musical emotion is the corresponding impact of the personal emotion caused by psychological reflect which is generated in the music-enjoying process from the moment the music was received. However, musical information acquisition, transition and transmission involved in the process would form into processing and storage eventually. Nevertheless, in order to make effective research on analysis process of musical emotion, it is essential for us to recognize where musical emotion lies[1]. Combined with corresponding music theories, the research process shows that the corresponding characteristics of music are embodied during the transmission process. The details are as follows:

Subjectivity

The musical works of the creator reflects his psychological emotion. It is the emotional sustenance object of the author which has a lot of subjectivity. As an aesthetic object, music is not a legible object, but often an ambiguous and hazy object without strict logic concept. Due to cultural, environmental and individual character differences of character, different people have different understanding of music.

Hierarchy

In the musical cognitive process, we make appropriate hierarchy division and put its style, mode and emotion as the highest level. However, in order to understand this hierarchy of cognitive process, effective understanding of lower hierarchy, such as rhythm, is rather required. From Figure 1, you can clearly see that the content of the so-called entrance characteristics system is rather extensive, which mainly includes the tone, value and pitch. For the spatial characteristics, rhythm, speed and intensity these three main factors, which are often mentioned in the daily life, are included. While for semantic characteristics, musical cognitive process requires logical reasoning of thought, to understand by heart and ultimately to make the view's heart and character can obtain a corresponding change[2].

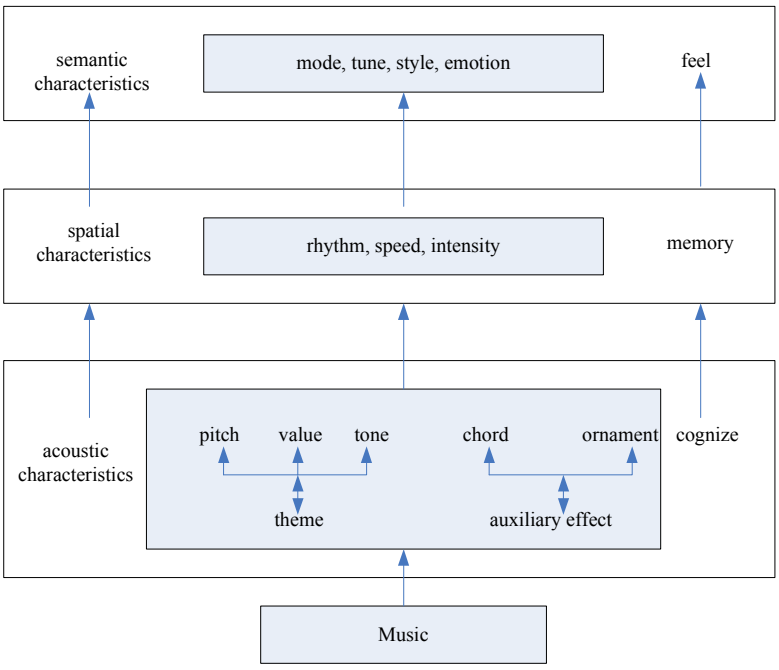


Figure 1 : Hierarchy of musical emotion cognition

Objectivity

For musical emotion, the inevitable consequence saved in the subjectivity misleads the judgment of musical types seriously. While the music has a two-sided nature, one side is certain while the other side is uncertain. The forms embodied by musical works often produce the corresponding imagination for viewers, thus the type judgment process would be affected accordingly, making it establish its own aesthetic standards to some extent. Due to the different art characteristic patterns in different musical works, constant changes would be produced during the aesthetic experience process. As a result, the aesthetic laws that followed should maintain the appropriate consistency.

Fuzziness

For the art field of music, emotion is an important way to carry out the full expression of its artistry. Constituted by a variety of artistic symbols, emotion has to fuse with the musical works to achieve the goal of fully expressing its artistry. However, in this process, the meanings of various musical symbols are not single, but have corresponding relations between art symbols. Due to the unclear relations, a corresponding fuzziness is developed. While from logical thinking perspective, artistic symbol has volatility and ambiguity to some extent[3]. This is one of the important characteristics existing in the musical emotion and also an important factor in achieving diversity of musical emotion expressiveness.

THAYER EMOTION MODE

The application of emotional stress model in the study process of human musical emotion is not very common, but many scholars have certain understandings of its construction thought. It can be seen from Figure 2, as a kind of two-dimensional coordinate model, this model does effective classification for human physiology (energy) dimension and psychological (stress) dimension, and thus it also can be regarded as a kind of musical emotion classification model.

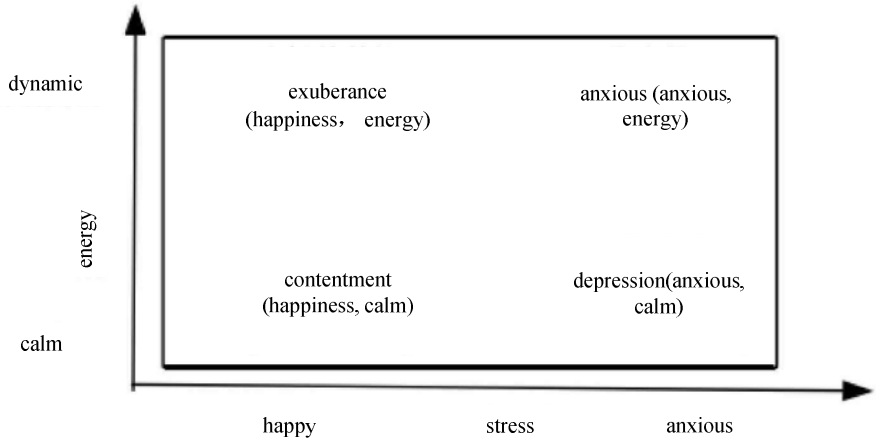


Figure 2 : Thayer model

It can be seen from the observation of Figure 2 that, the horizontal coordinate displays human emotions have a transformation from happiness to anxious gradually at night, which is a specific change in the internal psychological characteristics of human. However, the vertical coordinate displays human emotions have a transformation from happiness to anxious gradually and it is reflected in the physiological aspect. It can be divided into four parts on the basis of display status of the coordinate. The first part is mainly summed up as the calm with relatively lower psychological pressures and their own energy. The second part is summed up as anxious-calm with adjustable pressure and medium ability. The third part is summed up as dynamic with adjustable pressure and higher ability. The last part is summed up as anxious with relatively higher energy and the pressure as well as certain energy[4].

COMPUTING MODEL OF MUSICAL EMOTION

Corresponding discussion was done in the research and exploration process of above two psychological models, comparative method is used in the emotion classification. However, the computing model of emotional linguistic values is the final selection for discussion in this paper. In this way, we have an effective discussion by using these two basic computing models with wide application range: computing model of fuzzy theory and computing model of semantic similarity. Combined with the specific features of computing model of musical emotion motion and emotional linguistic values, emotion elements can gradually produce a corresponding emotion relation in the timeline (details are shown in Figure 3).

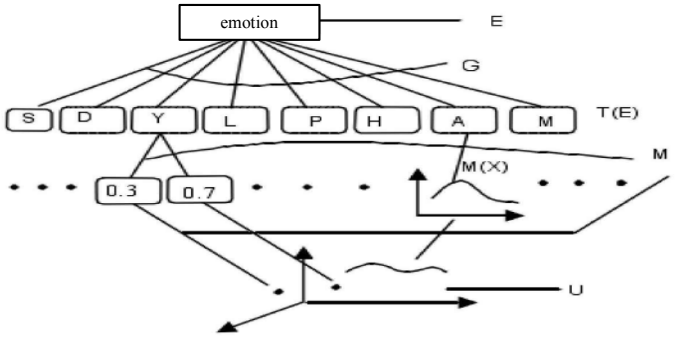


Figure 3 : Computing model on the basis of fuzzy theory

COMPUTING MODEL ON THE OF SEMANTIC SIMILARITY

During the first part of the research and discussion process, we carry out in-depth study on computing model of fuzzy theory, actively do conclusion and generalization of the basic characteristics of musical fuzzy emotion, and draw the conclusion that musical fuzzy emotion has close relation with the cognitive process of its musical emotion. But in the construction process of this model theory, there are corresponding problems haven't not been resolved yet, which mainly embodies the unclear definition of fuzzy membership function in the model, thus making it hard for computing model of emotional linguistic value to implement effective classification on musical emotion[5]. In this regard, many experts and scholars have put forward concrete solutions to solve this problem, Yongchuan TAN and relevant scholars improve it on the basis of emotional linguistic model and the computing model is produced accordingly. However, Tao LIU and other scholars conduct corresponding research and exploration on the basis of the above-mentioned improved method, specific definition research on emotional linguistic computing model and musical emotion is done, and make specific definition of linguistic value model and vector. Linguistic model is two-tuple (LA, R), details are shown as follows:

$$LA = \{L1, L2, L3, \ldots Ln\} \quad \textbf{(1)}$$

$$R = (r_{ij})_{n*n}, r_{ij} \in [0,1], i, j = 1, 2, \ldots n \quad \textbf{(2)}$$

In the enumeration process of above formula, LA represents the set composed by limited linguistic values, and R is similarity relationship existing in this set. N represents the total number of elements in the linguistic value set, and R shows the size of the semantic overlap existing between the two elements. As can be seen from the above description, in relational matrix, R mainly possesses two characteristic, the first one is $r_{ij} = r_{ji}$, while the second one is $r_{ii} = 1$. Combined with computing model of semantic similarity, the limited linguistic value set can be defined as form of {exuberant, passionate, bright, light, lyric, yearn, sad, sacred}, and can be used as expressing form of $LA = \{LA_i, i = 1, 2, \ldots, 8\}$. As for the expressing method of similarity degree of the music, you can use r (Music, LA_i) form to express.

The so-called musical emotion vector gives effective definition to its composition factors on the basis of computing model computing model of emotional linguistic value. Eight factors can be drawn through the above process, it may constitute vector set of $E = \{r(Music, LA_1), r(Music, LA_2), ..., r(Music, LA)\}$. However, to include the expressing form of similarity among these eight factors, and the larger one can be defined as the dominant emotion. For example, if the vector set is $E = (0.1, 0.0, 0.1, 0.3, 0.4, 0.9, 0.6, 0.2)$ during the computing process of musical emotion vector calculations, the resulting for, then the corresponding emotion is yearn and the music belongs to the type of yearn.

However, the model construction process of Tao LIU reflects a new breakthrough, which mainly realizes into two aspects. First, the specific computing of similarity value existing in the musical semantic is carried out, and then the vector expression existing among its emotion is given. Next is to make appropriate addition and subtraction process for the size of their emotional vector value. During the application process of this model, Tao LIU will conduct effective enumeration on eight kinds of emotional matrices. Details are shown in TABLE 1.

Two important conclusions can be drawn according to the computing results of the above model similarity value. First, with certain regularity, the characteristics in the computing model of emotional linguistic value mainly embody the same basic characteristics as the circle. For example, the similarity degree between lyric and sacred is much smaller than that between lyric and sad, which embodies the various transformation trends between the two different music types. Second, the block regions should be fully reflected, which is to make clear marks on blocks between various music types with similarity degree greater than 0.5. It can be seen clearly from TABLE 2, sad, yearn and lyric has high similarity, and the similarity degree between the other sub-types is close with exception of sacred. Details are shown as TABLE 2.

TABLE 1 : Similarity matrix of emotion model

#	Sacred	Sad	Yearn	Lyric	Light	Bright	Passionate	Exuberant
sacred	1.0000	0.4483	0.3621	0.3218	0.0862	0.2011	0.3966	0.6954
sad	0.4483	1.0000	0.7816	0.6207	0.1034	0.0402	0.1724	0.1879
yearn	0.3621	0.7816	1.0000	0.8391	0.2184	0.0805	0.0690	0.920
lyric	0.3218	0.6207	0.8391	1.0000	0.2931	0.1552	0.0000	0.1034
light	0.0862	0.1034	0.2184	0.2931	1.0000	0.8851	0.6034	0.3563
bright	0.2011	0.0402	0.0805	0.1552	0.8851	1.0000	0.7356	0.5345
passionate	0.3966	0.1724	0.0690	0.0000	0.6034	0.7356	1.0000	0.7586
exuberant	0.6954	0.1879	0.0902	0.1034	0.3563	0.5345	0.7586	1.0000

TABLE 2 : Block Regional Emotion Model

	Sacred	Sad	Yearn	Lyric	Light	Bright	Passionate	Exuberant
sacred								
sad								
yearn								
lyric								
light								
bright								
passionate								
exuberant								

THE APPLICATION OF EMOTION MODEL

In this paper, the research and discussion mainly conducts on the practical application process of computing model of emotional linguistic value. Further research on its emotional fuzziness should be done before the corresponding discussion process of the characteristics of musical emotion. It fully demonstrates the musical symbols in the mutual interaction process are not single, which embodies ambiguity in general and strengthened flexibility in the logical thinking. Of course, there are still a lot of different basic characteristics in musical emotion and the motility is one of the main manifestations. As the practice goes on, on human emotion would change in the course of music accordingly, thus making transaction can be formed between the emotions. It fully demonstrates that every single piece of music cannot be comprehensively described by a single word, so the comprehensiveness of music is not able to be fully reflected[7]. For instance, you may be aware of this song has a corresponding passion elements throughout it when hearing a quite cheerful music. As a result, in the corresponding computing process of its linguistic value, corresponding changes and adjustments should be produced. A piece of music is usually described from two different types of music, but it should follow these two main aspects:

First of all, the styles of these two pieces of music should remain the same in the computing value threshold. According to the basic characteristics of the computing model of emotional linguistic value, transition process only can be conducted by forming the interactive relation between musical emotional value threshold, just like a kind of cheerful and imaginative music, then the style of the other piece of music cannot be deep and sad.

Second, of two emotion types, it must differentiate what is dominant from what is secondary. Just as the same point of view discussed in the first part of this paper, dominant musical emotion should maintain a high-degree similarity with its own emotion, while the similarity is slightly lower for secondary musical emotion. If there are two emotions in music, then there will have dominant and secondary with clear guidance factors. For instance, there both have cheerful and imaginative as well as deep and sad emotions in a piece of music, then the cheerful and imaginative emotional factor is the dominant part, while deep and sad emotional factor is a subsidiary part, and vice versa.

Effective usage of above-mentioned emotions can be mainly carried out in two ways. Details are as follows:

First, define the dominant emotion as the standard. And this standard has a rather strict significance in the comparison and joint process of two pieces of music, which makes the analysis results of musical emotion maintain a high degree of accuracy.

Second, be targeted to relax restrictions of above-mentioned standard. During comparison results process regulated by experiments, appropriate relaxation of standard can constantly improve the identity of musical comparison and ensure the validity of results can be strengthened continually.

As can be seen from the above discussion process, in the case of dominant and secondary model of musical emotion, they both established on the basis of computing model of emotional linguistic value. By fully utilizing its characteristics, the

motility and fuzziness of musical emotion can be better embodied, while the experiment and results would have more positive impacts as well.

CONCLUSION

The above-mentioned content is the corresponding exploration and research process made by this paper on the basis of construction process the musical analysis theory on its emotion model, and also is an effective exploration process with the combination of the characteristics owned by the model. It also conducts relevant data analysis combined with mathematical matrix algorithms and provides strong support according to the conclusion they have drew. In addition, this paper does inspection on musical emotion analysis process through model application process in order to provide practical support for this research.

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